CEILING COLLAPSE IN THE PATH (PORT AUTHORITY TRANS-HUDSON) JOURNAL SQUARE TRANSPORTATION CENTER, JERSEY CITY, N.J.

(98-28)

HEARING

BEFORE THE

COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION
HOUSE OF REPRESENTATIVES

NINETY-EIGHTH CONGRESS

FIRST SESSION

NOVEMBER 7, 1983, AT JERSEY CITY, N.J.

Printed for the use of the Committee on Public Works and Transportation

U.S. GOVERNMENT PRINTING OFFICE
29-689 O WASHINGTON : 1984

H641-2

COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION

JAMES J. HOWARD, New Jersey, *Chairman*

GLENN M. ANDERSON, California
ROBERT A. ROE, New Jersey
~~JOHN B. BREAUX~~, Louisiana
NORMAN Y. MINETA, California
ELLIOTT H. LEVITAS, Georgia
JAMES L. OBERSTAR, Minnesota
HENRY J. NOWAK, New York
ROBERT W. EDGAR, Pennsylvania
ROBERT A. YOUNG, Missouri
NICK JOE RAHALL II, West Virginia
DOUGLAS APPLEGATE, Ohio
GERALDINE A. FERRARO, New York
BRIAN J. DONNELLY, Massachusetts
DONALD JOSEPH ALBOSTA, Michigan
~~RON DE~~ LUGO, Virgin Islands
GUS SAVAGE, Illinois
FOFO I. F. SUNIA, American Samoa
KATIE HALL, Indiana
DOUGLAS H. BOSCO, California
JAMES F. McNULTY, Jr., Arizona
JIM MOODY, Wisconsin
ROBERT A. BORSKI, Pennsylvania
JOE KOLTER, Pennsylvania
TIM VALENTINE, North Carolina
EDOLPHUS TOWNS, New York
WILLIAM O. LIPINSKI, Illinois
MICHAEL A. ANDREWS, Texas
TOM J. VANDERGRIFF, Texas
J. ROY ROWLAND, Georgia
JAMES McCLURE CLARKE, North Carolina
ROBERT E. WISE, Jr., West Virginia

GENE SNYDER, Kentucky
JOHN PAUL HAMMERSCHMIDT, Arkansas
BUD SHUSTER, Pennsylvania
ARLAN STANGELAND, Minnesota
NEWT GINGRICH, Georgia
WILLIAM F. CLINGER, Jr., Pennsylvania
GUY V. MOLINARI, New York
E. CLAY SHAW, Jr., Florida
BOB McEWEN, Ohio
FRANK R. WOLF, Virginia
THOMAS E. PETRI, Wisconsin
HAL DAUB, Nebraska
LYNN MARTIN, Illinois
VIN WEBER, Minnesota
ROBERT F. (BOB) SMITH, Oregon
DON SUNDQUIST, Tennessee
NANCY L. JOHNSON, Connecticut
RON PACKARD, California

CONTENTS

TESTIMONY

Page

Connolly, William, director, Division of Housing and Development, New Jersey Department of Community Affairs 175

Convisser, Martin, Director, Office of Industry Policy, U.S. Department of Transportation; accompanied by Alfred Delli Bovi, Regional Administrator for Region II, Urban Mass Transportation Administration, Franz K. Gimmler, Deputy Assistant Administrator for Engineering and Applications, Urban Mass Transportation Administration, and Lloyd G. Murphy, Chief, Office of Safety and Security, Urban Mass Transportation Administration 161

Goldmark, Peter C., Jr., executive director, the Port Authority of New York and New Jersey; accompanied by Richard Tomasetti, senior vice president, and principal, Lev Zetlin Associates 11

SUBMISSIONS FOR THE RECORD

Goldmark, Peter C., Jr., executive director, the Port Authority of New York and New Jersey:
  - Statement 4
  - Press release of November 3, 1983 5
  - Interim report prepared by Lev Zetlin Associates, Engineers & Designers, November 2, 1983: "Engineering Investigation Concerning the Causes of the Collapse of the Suspended Plaster Ceiling at the Journal Square Transportation Center on August 8, 1983" 12
  - Letter supplementing testimony 158

Guarini, Hon. Frank J., a Representative in Congress from the State of New Jersey, letter from Irving Grossinger 149

Howard, Hon. James J., a Representative in Congress from the State of New Jersey, and chairman, Committee on Public Works and Transportation, letter from Secretary of Transportation 160

ADDITION TO THE RECORD

Burnett, Jim, Chairman, National Transportation Safety Board, letter 181

CEILING COLLAPSE IN THE PATH (PORT AUTHORITY TRANS-HUDSON) JOURNAL SQUARE TRANSPORTATION CENTER, JERSEY CITY, N.J.

MONDAY, NOVEMBER 7, 1983

House of Representatives,
Committee on Public Works and Transportation,
Jersey City, N.J.

The committee met, pursuant to call, at 9:45 a.m., at Journal Square Transportation Center, 1 PATH Plaza, Jersey City, N.J.

Present: Representatives James J. Howard (presiding), Robert A. Roe, and Frank Guarini.

The **Chairman**. The Committee on Public Works and Transportation of the U.S. House of Representatives will come to order.

The Committee on Public Works and Transportation, this morning, is here to hear testimony on the tragic accident of August 8, in which two people were killed by the collapse of a ceiling in this building.

At this point the investigations into the accident are still underway and no final conclusions have yet been reached. It is not the intention of this committee to prejudice these investigations in any way.

However, with the port authority issuing an interim report just 4 days ago, the time does seem appropriate for a review of the circumstances that led to the accident. We are not here to prosecute anyone, but we are here to find out what happened.

The committee became involved in the investigation of the accident at the request of my colleague from New Jersey, Frank Guarini, who is with us this morning. The matter was within our jurisdiction because $39 million in Urban Mass Transportation Administration funds were used in the construction in the Journal Square Transportation Center in which we are now sitting.

We will, this morning, be receiving testimony from officials of the Port Authority of New York and New Jersey concerning the decisions that were made on the construction of the ceiling and the subsequent repair procedures. We hope to avoid any needless fingerpointing and simply find out what happened and how it can be prevented in the future.

We will also hear from the officials of the Department of Transportation, concerning the Department's role in monitoring the use of funds it distributes.

We may, if necessary, take legislative action to give the Department expanded monitoring and inspection responsibility.

Finally, we will hear the views of State officials on their jurisdiction over facilities such as the Journal Square Transportation Center.

It is my opinion that the port authority operation of the PATH line has been of great benefit for northern New Jersey and I hope the port authority can continue to provide that type of service in the future.

At this point I would like to thank the port authority for its cooperation in setting up these hearings and for allowing us to use this room. I am very, very grateful that during this busy time two of my colleagues have taken the time to be here this morning. The chairman of our Water Resources Subcommittee, who has been involved in transportation and transportation safety throughout his career, my friend and colleague, Congressman Robert A. Roe, of northern New Jersey. I was going to state the boundaries of his congressional district, but I find we cannot do that in New Jersey at this time.

So, if he has any opening statement, I would be glad to hear it.

Mr. ROE. I thank the Chairman. I do not have a formal opening statement. I had been here earlier and we looked over the area that was affected, and I think that above and beyond the factfinding issues involved, what we would want to determine and hopefully the testimony will bear that out. The present safety of the area is considered, and I see there is a lot of scaffolding work that has been done, and I would like to pursue that a little bit, to be sure that the building is considered to be safe at this point, while this other investigation is going on and the determinations are made to correct it. That I think is the fundamental purpose.

And then also what is happening nationally, and what we should be doing legislatively, should there be any legislation that is needed in public construction of buildings. So that is the direction I would like to pursue, Mr. Chairman.

The CHAIRMAN. Thank you very, very much, Mr. Roe. And, of course, the person who has been most active concerning this episode in the Congress of the United States. Although he is not a member of the Public Works and Transportation Committee but he is a member of the Committee on Ways and Means in the Congress. It is in his congressional district that this facility stands. I would like to at this time recognize my good friend and colleague, Congressman Frank Guarini.

Mr. GUARINI. Thank you very much, Mr. Chairman. I thank you for holding these hearings and I welcome both you and my good colleague, Bob Roe, for being here to examine this very timely and important subject matter.

On August 8, 1983, nearly one-half hour after tens of thousands of rush-hour commuters had passed underneath on their way to work, 50 tons of ceiling material came crashing down from its hangers on the main concourse level of PATH's Journal Square Terminal. The tragic deaths of two people walking underneath could have been many, many more, perhaps numbering in the hundreds, had the accident happened earlier.

I might say there is no way of getting to New York from the State of New Jersey that I know of, other than using port authority facilities.

This incident raised many questions about the port authority's accountability and unique independence from public scrutiny. The port authority is one of the most pervasive public bodies in the region with responsibility for over $5 billion in facilities serving the New York and New Jersey area. And yet as much as we deal with the port authority in our daily routine, it appears that to most of the public it is a silent and faceless entity.

Although it has served very well and has done a very good job in providing transportation of facilities to the New Jersey/New York metropolitan area, there is often little accountability.

I have asked Chairman Howard, on the Public Works and Transportation Committee, to come to Jersey City to explore three main areas. First, while in hindsight the cause of the accident is clear, why had nothing been done to fix a problem which had been noticed many months earlier? Second, has there been proper use of the Federal funds used to help finance the construction in the PATH Journal Square terminal? It seems to me that a building only 11 years old would have been much sturdier and not susceptible so early in its life to such an accident.

Did anyone cut cost in the design and construction of this building? Were all the Federal urban mass transportation funds awarded to this project spent here at this site for material of high quality? Who was responsible for such shoddy workmanship? Was there proper supervision of the work and materials used?

Furthermore, the status of the port authority's independence from State and local buildings code supervision is called into question. This independence was not passed on lightly, and yet it seems clear from the preliminary reports that were issued just last Thursday, that the public trust for the port authority self-policing may be misplaced and must be questioned.

Is it prudent to continue to allow the port authority to be exempt from State and local supervision? Should the Federal Government certify the safety of design construction and maintenance of transportation facilities it helps finance?

I have prepared legislation to require such Federal supervision. Perhaps in today's hearings we will be able to get some constructive recommendations and be able to form proper legislation from the recommendations and suggestions that are given.

I just want to say that there will be certainly great interest in the hearings that are being held today. There are a number of questions that have to be answered, even though a report was given preliminarily last Thursday. But I would ask that the record be open until final reports are made and that all the statements, written statements that have to be submitted into the record, and should they require any further hearings on the matter after final reports are in, it would be up to the chairman to make that determination at such time.

So I want to thank you very much for being here and wish that we could proceed with the testimony at this time.

The CHAIRMAN. Thank you very much. The gentleman from New Jersey.

Mr. ROE. Mr. Chairman, I noted around the wall we have two very important signs here and it says "Who, What, When, Where and Why?" They are appropriate, that is for sure.

The **Chairman**. Thank you very much. The Chair would like to state that although we do have witnesses representing the active agencies that are involved or should be involved concerning this subject, that the record of this hearing will remain open for 2 weeks for anyone who wishes to submit testimony for inclusion in the record.

Before we begin with our first panel, I would like to recognize a public official who is here today, and that is Mr. Robert C. Janiszewski, a member of the New Jersey General Assembly. We appreciate your appearance here today.

Mr. **Janiszewski**. Thank you.

The **Chairman**. Thank you very much.

Our first witnesses will be a panel of two. If they would please come up to the witness stand. Mr. Peter C. Goldmark, Jr., the executive director of the port authority of New York and New Jersey; Mr. Richard L. Tomasetti, principal of the Lev Zetlin Associates.

Mr. Goldmark, we do have a copy of your testimony here at this time. Without objection, that will be made a part of the record at this point.

Do you have any formal testimony, Mr. Tomasetti, or are you here for informational purposes?

Mr. **Tomasetti**. I have no written testimony.

[Mr. Goldmark's prepared statement follows:]

STATEMENT OF PETER C. GOLDMARK, JR., EXECUTIVE DIRECTOR, THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY

I am pleased at being given this opportunity to speak to you on the tragic ceiling collapse at Journal Square which occurred August 8, 1983. In addition, I have submitted an Interim Report prepared by Lev Zetlin Associates Inc., retained by the Port Authority to perform an independent engineering analysis of the causes of the collapse.

I want to stress that this is not the final report on the investigation into the collapse which both a Port Authority Investigating Committee and Lev Zetlin Associates are conducting independently.

Although many phases of the overall investigation are not complete, sufficiently conclusive information is available in regard to certain deficiencies during the original design and installation phase of the ceiling to warrant submission of an Interim Report at this time.

Enough information is now available, summarized in this Interim Report, to indicate that a design and/or installation deficiency contributed to the ceiling collapse; both the Investigating Committee and Lev Zetlin Associates are continuing their inquiries into the question of the roles and responsibilities of the various parties involved in the design and construction of the Journal Square Transportation Center.

While it would not be proper or possible at this point to deal with the specifics of matters still under investigation, I can say that the following general conclusions have emerged:

There was a failure in carrying out responsibilities and coordination in the design and installation of the ceiling;

Shoring to support the ceiling should have been used August 8 when repairs began; and

There were breakdowns in management and supervision of the reporting, diagnosis, and repair procedures for the ceiling after a sag occurred in the spring of 1982. This includes management and supervision of those procedures by Port Authority/PATH personnel.

As in most tragedies of this nature, the ceiling collapse did not occur because of one single, isolated, error. The pattern that is emerging is one of a series of errors and deficiencies. The final report, when we are satisfied that we have fairly and fully evaluated all the relevant information available, will make specific identification of these errors and of the organizations or individuals which in our judgement are responsible for them.

At the same time another major phase of the investigation is centering on the reporting, diagnosis and repair procedures used once problems with the ceiling were observed. Among the questions being addressed are:

Was a reasonable diagnosis of the ceiling defects made?

Was there an inordinate delay between observation of ceiling suspension problems and the institution of a repair procedure?

Should precautionary measures have been taken when the ceiling problems were first observed?

Were the repair procedures appropriate and were proper safety precautions exercised for both employees and the public in instituting the repair?

Were there weaknesses in construction industry practices that contributed to the ceiling collapse?

Were there defects in ceiling installations elsewhere in the country and were they properly communicated within the construction industry?

Were there deficiencies in design, installation, maintenance, repair, or management; and if so, what were the failures in responsibility and communication?

These are the questions the final report will address. In addition to this investigation, we have retained the engineering firm of Ammann & Whitney which is currently conducting an inspection and total structural review of the Journal Square Transportation Center. As a result of the work done to date, we have ordered the removal of the suspended ceiling over the passenger platforms at Journal Square. This ceiling was secured by scaffolding immediately after the collapse, but it has been determined that this ceiling cannot be permanently reinforced, and therefore must be replaced.

The investigation is being pursued carefully, objectively, and thoroughly. We are sharing the results of the investigation with appropriate state and local law enforcement officials, as well as the United States Department of Transportation and this committee of the Congress.

I share the concern of your committee both that the investigation let the chips fall where they may, and that we not rush to judgment until all the relevant facts are obtained and evaluated. Accordingly, the Interim Report deals with that area of the investigation which is substantially complete, and where reliance can be placed on the findings. The Final Report will be equally thorough and painstaking in its effort to ascertain the truth and prevent the recurrence of such a tragic occurrence in the future. I will be happy to answer any questions your committee has at this time.

NEWS RELEASE, NOVEMBER 3, 1983

An interim report by an independent consulting engineering firm revealed that the ceiling collapse at the PATH Journal Square Transportation Center in Jersey City on August 8 was caused by the fracture of prepunched metal deck tabs due to overloading beyond their designed capacity.

The report made public today by the Port Authority said that when a mechanic entered the ceiling that morning his additional weight caused a highly loaded tab to fail. This additional load was distributed to the other tabs, which also were highly loaded, and started their sequential failure, thus causing the total collapse.

The accident caused the death of two persons, one a PATH employee, and injuries to 12 others.

The consulting firm, Lev Zetlin Associates, Inc. of New York City, stated in its interim report: "The primary cause which initiated this failure occurred during the design and construction phase of the JSTC project. In our opinion, a specific restriction in the specifications and shop drawings under one contract for the steel deck, limiting the load that could be applied to the tabs, was not properly coordinated with another contract for the construction of the ceiling."

(See attached report for details on the suspended cement plaster ceiling.)

In his transmittal letter of the interim report to the Port Authority Commissioners, Executive Director Peter C. Goldmark, Jr. wrote that Lev Zetlin Associates and the Port Authority Investigating Committee are continuing their inquiries into the roles and responsibilities of the various parties involved in the design and construction of the Center, and at the same time another major phase of the investigation is centering on the reporting, diagnosis and repair procedures used once problems with the ceiling were observed.

He wrote: "Among the questions being addressed are:

"Was a reasonable diagnosis of the ceiling defects made?

"Was there an inordinate delay between observation of ceiling suspension problems and the institution of a repair procedure?

"Should precautionary measures have been taken when the ceiling problems were first observed?

"Were the repair procedures appropriate and were proper safety precautions exercised for both employees and the public in instituting the repair?

"Were there weaknesses in construction industry practices that contributed to the ceiling collapse?

"Were there defects in ceiling installation elsewhere in the country and were they properly communicated within the construction industry?

"Were there deficiencies in design, installation, maintenance, repair, or management; and if so, what were the failures in responsibility and communication?"

In his commentary on the interim report at the news conference this morning, Port Authority Chairman Alan Sagner stated: "Speaking for the Board, it has been our intention from the outset to permit whatever avenues of investigation are warranted to truly get to know what happened, and to prevent it from happening here or elsewhere. This is our purpose.

"The Board has directed our own staff, as well as the consultants, to let the chips fall where they may as they pursue the details relating to this accident. Those conducting the investigation are not yet in a position to make any determinations relating to the roles and functions and responsibilities of individuals involved in this incident. As facts are gathered they are being shared with local, state and federal officials who have legal responsibilities to pursue this further if the facts warrant.

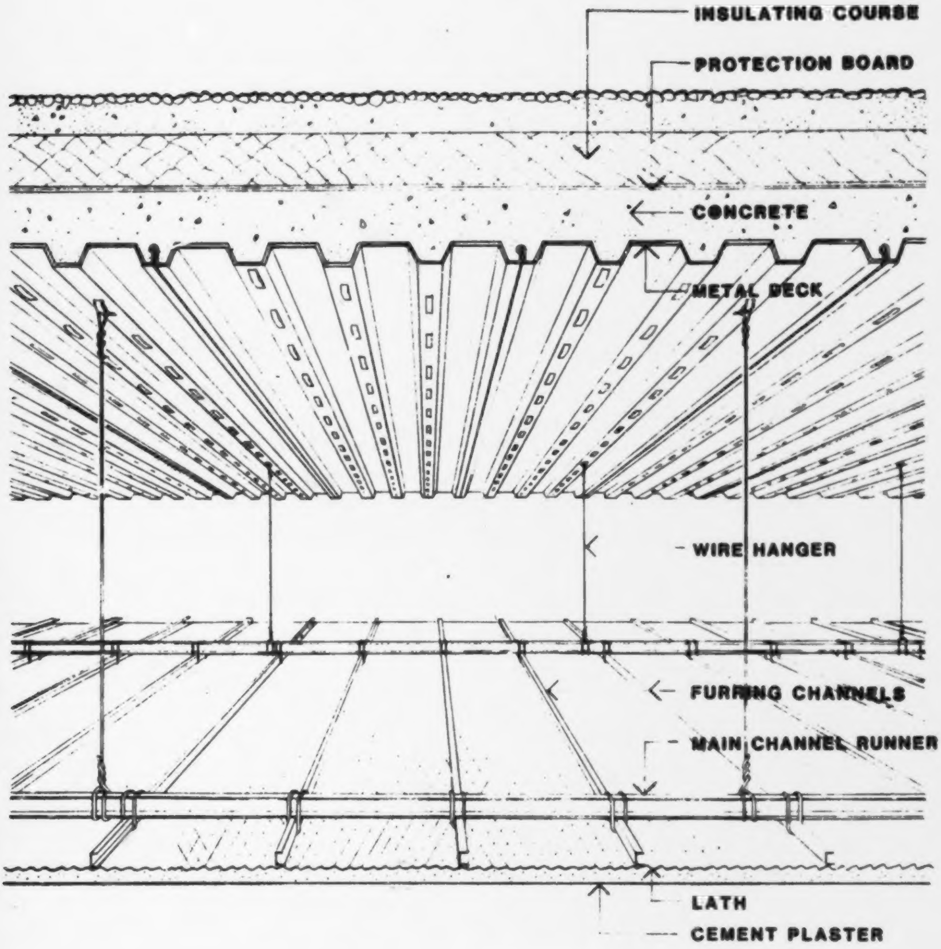
"Staff and consultants have provided detailed briefings at every Board meeting to update the members. We have assured Executive Director Peter Goldmark and his review team that they will get as much time as needed and whatever resources are required to ascertain the facts in this matter.

"On behalf of the Board, I want to express our full confidence in and appreciation to the members of the review team and to the consultants for their total objectivity, professionalism and dedication in carrying out this difficult assignment," he said.

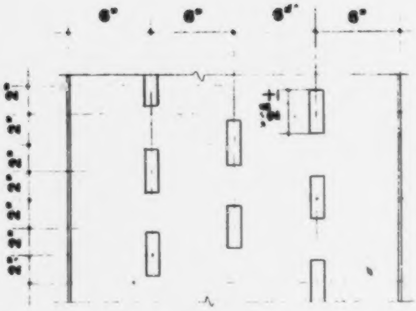
In discussing the progress of the investigation, Mr. Goldmark said: "At this juncture, with all the roles and responsibilities yet to be determined, it is not proper or possible for me to identify organizations or individuals and their responsibilities in this matter. But one thing is clear: that persons contracted by the Port Authority and personnel of the Port Authority itself must share in the burden that resulted in the loss of lives and injury to the victims of the ceiling collapse on August 8, 1983.

"None of us is interested in witch hunts or blood baths. Our primary focus is to find out exactly what happened so that we might assure the integrity of any similarly designed facilities within the Port Authority jurisdiction or elsewhere in this country. Similarly, this investigation will serve as an essential guide in tightening administrative, inspection, and maintenance procedures to avoid oversights and lapses in communication that all contributed in some measure to the problem. The final report will speak in greater detail on the other areas which so deeply concern us," he concluded.

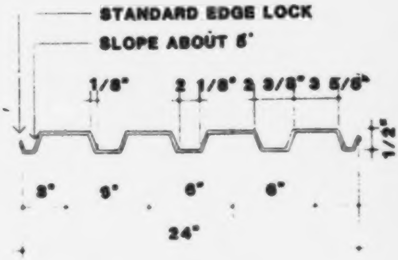
The Port Authority Investigating Committee under the overall direction of Assistant Executive Director Robert F. Bennett comprises Daniel M. Hahn, Engineer of Design for Tunnels, Bridges and Terminals; James J. Kirk, Deputy Director of the Rail Transportation Department; and Saverio G. Girimonti, Staff Maintenance Evaluation Engineer. Lev Zetlin Associates is represented by Senior Vice President and Principal Richard L. Tomasetti. None of the members of the Committee had any responsibilities connected with the design and/or construction of the Transportation Center.


INSULATING COURSE
PROTECTION BOARD
CONCRETE
METAL DECK
WIRE HANGER
FURRING CHANNELS
MAIN CHANNEL RUNNER
LATH
CEMENT PLASTER

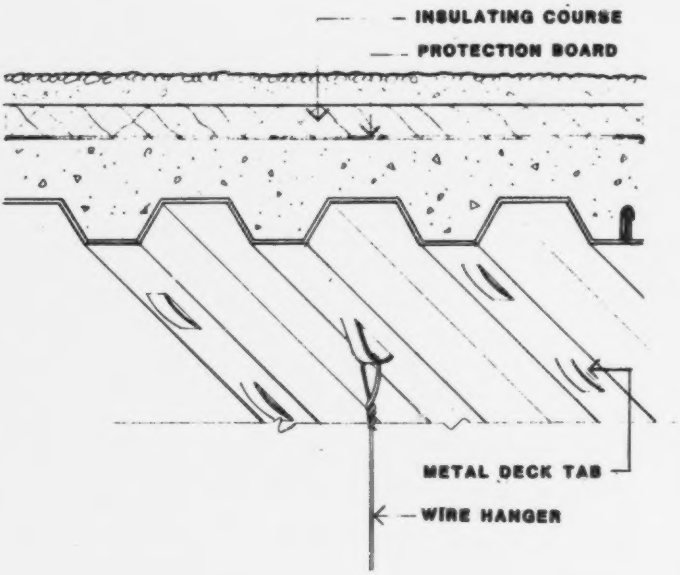
SECTIONAL VIEW-
FLOOR CONSTRUCTION & HUNG PLASTER CEILING


6"
6"
6"
6"
2"
2"
2"
2"
2"
2"
2"
6"
6"

PLAN


STANDARD EDGE LOCK
SLOPE ABOUT 5°
1/8"
2 1/8"
2 3/8"
3 5/8"
1 1/2"
3"
9"
6"
6"
24"

SECTION


INSULATING COURSE
PROTECTION BOARD
METAL DECK TAB
WIRE HANGER

VIEW OF METAL DECK TAB & WIRE HANGER

5

ARCHITECTURAL & DESIGN CONSULTANTS FOR JSTC (Reported to Chief of Planning)

Leibowitz/Bodouva & Associates - Architectural Concept & General Design

Robert H. Fava & Associates (after 1974 became Becker, Bendixen & Murphy) - Detailed Design - Contract Drawings & Specifications - Review & approve materials & shop drawings

Principal Contact - John B. Murphy

Sub-consultants to Fava & Associates

- Wiener & Thaler - Structural Design
- Meyers & Locker - Mechanical & Electrical Design
- A. E. Bye - Landscaping

CONSTRUCTION COORDINATION CONSULTANT (Reported to Chief of Construction)

Wigton-Abbott Corporation
Field Representative - Russell E. Montgomery

JOURNAL SQUARE TRANSPORTATION CENTER
PRIME CONTRACTORS

PAT 250.026	Excavation and Foundations - Gardner M. Bishop, Inc., Thomas Crimmins Contracting Co. -- Joint Venture
PAT 250.024/025	Structural Steel - Bethlehem Steel Corp.
PAT 250.029	Architectural Precast Concrete - Eastern Schckbeton - Division of Rockwin Corp.
PAT 250.030	Elevators & Escalators - Haughton Elevator Co.
PAT 250.031	Storefronts, Windows & Glazing - American Paterson Glass Co.
PAT 250.032/.033	General Construction - Blitman Construction Company *
PAT 250.034	Structural Precast Concrete - Kenvil Newcrete Products Co.
PAT 250.036/.038/ .039	Heating, Ventilating and Air Conditioning; Sprinklers; Plumbing - The Frank A. McBride Co.
PAT 250.037	Electrical - Beach Electric Co., Inc.

*Blitman was responsible for structural concrete, and nearly all interior finishes such as walls, floors and ceilings. Blitman engaged the service of approximately thirty (30) sub-contractors to perform these items of construction and was responsible for coordinating the work of their sub-contractors.

TESTIMONY OF PETER C. GOLDMARK, JR., EXECUTIVE DIRECTOR, THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY, ACCOMPANIED BY RICHARD TOMASETTI, SENIOR VICE PRESIDENT AND PRINCIPAL, LEV ZETLIN ASSOCIATES

Mr. **Goldmark**. Thank you, Mr. Chairman. For Congressman Roe's information, this is a room used for police training. And he spotted the two signs, and I think that is, perhaps, a very appropriate sign for today. Those are signs used in the police-training courses that are normally given in this room.

Mr. **Chairman**. As an aside, not directed in that area, if there are any members of the media here, I believe that those words are supposed to be very important in first-year journalism classes also.

Mr. **Goldmark**. Mr. Chairman, I am pleased to report to you and this committee on the status of our investigation into the tragic ceiling collapse at Journal Square on August 8.

We have submitted to your committee an interim report prepared by Lev Zetlin Associates, retained by the port authority to perform an independent engineering analysis of the causes of the collapse. And Mr. Richard Tomasetti, senior vice president and principal of that firm, is here with me today to summarize for you the burden of that report.

[Report referred to follows:]

[Mr. Goldmark's testimony resumes on page 132.]

INTERIM REPORT

ENGINEERING INVESTIGATION CONCERNING THE CAUSES OF THE COLLAPSE OF THE SUSPENDED CEMENT PLASTER CEILING AT THE JOURNAL SQUARE TRANSPORTATION CENTER ON AUGUST 8, 1983

SUBMITTED TO:

PORT AUTHORITY OF NEW YORK
AND NEW JERSEY
1 WORLD TRADE CENTER
NEW YORK, NEW YORK

PREPARED BY:

LEV ZETLIN ASSOCIATES, INC.
ENGINEERS & DESIGNERS
95 MADISON AVENUE
NEW YORK, NEW YORK 10016

NOVEMBER 2, 1983

LZA Lev Zetlin Associates, Inc.. Engineers and Designers
95 Madison Avenue, New York, New York 10016 (212) 889-3130

FOUNDED IN 1956

CHARLES H. THORNTON Ph.D. P.E.
RICHARD L. TOMASETTI P.E.

JOSEPH N. ZULIANI
ABRAHAM GUTMAN P.E.
FRANK H. FOSTER JR. P.E.
JAGDISH PRASAD P.E.
DANIEL A. CUOCO P.E.

ROBERT A. FAIRBANKS P.E.
I. PAUL LEW P.E., R.A.
CRAIG E. BARNES P.E.

UDOM HUNGSPRUKE
FRUMA NAROV P.E.
JOEL S. WEINSTEIN P.E.

November 2, 1983

Mr. Robert F. Bennett
Assistant Executive Director
THE PORT AUTHORITY OF NY & NJ
One World Trade Center
New York, New York 10048

RE: LZA INVESTIGATION
JOURNAL SQUARE TRANSPORTATION CENTER
CEMENT PLASTER CEILING COLLAPSE

Dear Mr. Bennett:

Enclosed please find an Interim report on the above-referenced project. Conclusions presented in this report may be subject to revisions based on final review of all accummulated data.

Although we have provided technical consultation to the investigating committee, this report is an independent and objective analysis on the probable technical causes of the collapse of the cement plaster ceiling. It is based on having all documents and information available to us as we requested in order to perform an accurate report.

If you have any questions, please do not hesitate to contact us.

Sincerely,

LEV ZETLIN ASSOCIATES, INC.

Richard L. Tomasetti
Senior Vice President

RLT:dmr

NEW YORK, NEW YORK BOSTON, MASSACHUSETTS WASHINGTON, D.C.

LZA

INTERIM REPORT

ENGINEERING INVESTIGATION CONCERNING THE COLLAPSE OF THE SUSPENDED CEMENT PLASTER CEILING AT THE JOURNAL SQUARE TRANSPORTATION CENTER ON AUGUST 8, 1983

Submitted to:

PORT AUTHORITY OF NEW YORK AND NEW
JERSEY
Investigation Committee
1 World Trade Center
New York, N.Y.

Submitted by:

LEV ZETLIN ASSOCIATES, INC.
ENGINEERS AND DESIGNERS
95 Madison Avenue
New York, N.Y. 10016

—

Metallurgical and Testing
Consultants
Lucius Pitkin, Inc.

TABLE OF CONTENTS

PAGE

I. INTRODUCTION

A. START OF THE INVESTIGATION 1-2
B. SCOPE OF THE WORK 2-4

II. SUMMARY

A. DESCRIPTION OF FAILURE AND ITS CAUSE 5-9
B. CEILING CONSTRUCTION 9-12
C. TECHNICAL DEFICIENCY 12

III. PROJECT AND CONSTRUCTION DESCRIPTION

A. GENERAL DESCRIPTION OF THE JSTC 13-14
B. DESCRIPTION OF SUSPENDED CEILING CONSTRUCTION AND CONNECTIONS 14-16

IV. OBSERVATIONS, INSPECTION AND TESTING

A. INITIAL OBSERVATIONS 17-20
B. INSPECTION AND TESTING 21-28

V. ANALYSIS

A. LOADS AND DEFLECTIONS 29-34
B. TECHNICAL CAUSE OF FAILURE 34-39

VI. REVIEW OF DOCUMENTS

A. GENERAL 40-41
B. REVIEW OF WORKING DRAWINGS 41-45
C. SPECIFICATIONS 45-51
D. SHOP DRAWINGS 51-56

VII. REVIEW OF LITERATURE AND CODES

A. APPLICABILITY ON THIS PROJECT FOR THIS TYPE OF CONSTRUCTION 57
B. COMPLIANCE WITH CODES FOR THIS TYPE OF CONSTRUCTION 57-61

VIII. CONCLUSIONS

A. INITIATING CAUSE OF FAILURE 62-63
B. REASON FOR TOTAL COLLAPSE 63-64
C. DEFICIENCIES DURING DESIGN AND CONSTRUCTION OF THE JSTC 64
D. OTHER CONCLUSIONS 65-66

APPENDIX A - DRAWINGS
APPENDIX B - LUCIUS PITKIN INC. REPORT

I. INTRODUCTION

A. START OF INVESTIGATION

At approximately 9:00 A.M. on August 8, 1983, the suspended cement plaster ceiling at Journal Square Transportation Center (JSTC) at the concourse level entrance well to the PATH System collapsed. The ceiling collapse occurred when a mechanic entered the ceiling to begin a remedial repair procedure. The repair procedure was to provide new attachments for the ceiling suspension system hangers, in an area where the ceiling was observed to be sagging.

Peter C. Goldmark, Jr., Executive Director of The Port Authority of New York and New Jersey (PANYNJ), formed an Investigating Committee composed of representatives of the PANYNJ Engineering Department, Rail Transportation Department and Risk Management Division to determine the cause(s) of the ceiling collapse. This Committee, under the overall direction of Assistant Executive Director Robert F. Bennett, is composed of Daniel M. Hahn, James J. Kirk and Saverio G. Girimonti.

The Port Authority also retained Lev Zetlin Associates, Inc. (LZA) to perform an Engineering Investigation of the collapse, in conjunction with the Port Authority's overall investigation of the incident and events leading up to the collapse.

LZA has been engaged as a consultant to the PANYNJ Investigating Committee to provide an objective, independent engineering evaluation of the probable cause(s) leading to the collapse of the ceiling. LZA is also providing technical consultation to the Investigating Committee and advising the Committee on any issues requiring further inquiry that may arise out of LZA's work.

The firm of Lucius Pitkin, Inc. (LPI) of New York City was retained by LZA to perform metallurgical analysis and field survey work.

B. SCOPE OF THE INTERIM REPORT

The interim report covers the technical aspects of the collapse. Many areas of the investigation are not completed, and many major questions, therefore, are not addressed in this interim report. The scope of LZA's work that has been substantially completed and summarized in this interim report is as follows:

1. Conduct site observations of the collapsed ceiling during the afternoon of the day of the collapse and afterward at the dump where portions of the ceiling were retained.

2. Conduct field investigations of the plaza structural slab assembly from which the ceiling was suspended.

3. Develop inspection and testing programs for the metal deck and the ceiling assembly, and oversee and review the inspection work and metallurgical analysis by Lucius Pitkin, Inc.

4. Review the contract documents, working drawings and specifications, shop drawings and other pertinent correspondence and documents.

5. Analyze the design of the suspended cement plaster ceiling construction.

The scope of LZA's work that is underway and not completed, which will be included in LZA's final report, is as follows:

1. Participate with the Investigating Committee in interviews of the Architect, the Contractors, and various other parties who participated in the design and construction of the suspended ceiling.

2. Review of roles and responsibilities during the design and construction of the JSTC suspended ceiling.

3. Review of industry practice for the design and construction of suspended cement plaster ceilings.

4. Review the PANYNJ engineering inspection reports concerning the ceiling and the remedial measures planned for the ceiling prior to its collapse.

5. Participate with the Investigating Committee in interviews of PANYNJ personnel and contractors involved in past ceiling inspection and maintenance and in the planned remedial measures.

II. SUMMARY OF INTERIM FINDINGS

A. DESCRIPTION OF FAILURE AND ITS CAUSE

On August 8, 1983 a suspended cement plaster ceiling collapsed at the concourse level surrounding the entrance well to the PATH Station. The suspended cement plaster ceiling was approximately 10,500 square feet in area and was approximately 80 feet wide by 150 feet long. (See drawings 1, 2 and 3 in Appendix A)

The collapsed ceiling was a conventional suspended cement plaster ceiling composed of cement plaster applied to metal lath (wire mesh) which is supported by steel furring channels spaced 1 foot apart, and steel main runner channels spaced 4 feet apart, perpendicular to each other. The main runner channels were hung by wire hangers, typically spaced to form a 4 ft. by 4 ft. grid. The wire hangers were typically attached to tabs prepunched in the metal deck of the plaza level floor construction, which was approximately 8-1/2 feet above the suspended cement plaster ceiling. Within the ceiling space were drain pipes connected to the plaza drains above. (See drawings 4, 5 and 6 in Appendix A.) Under the concrete planter shown on the drawings, embedded concrete studs with clips were used as anchors for the wire hangers.

In our opinion, the initiating cause of the failure of the ceiling was the fracture of the prepunched metal deck tabs, which were of insufficient strength to provide an appropriate factor of safety for this type of construction. The following summarizes the basis for this conclusion.

The weight of the ceiling construction alone (dead weight) applies a load of approximately 200 lbs. to each of the metal tabs used to hang the ceiling. Field tests of the tabs at JSTC, conducted by Lucius Pitkin, Inc., indicated a breaking capacity which varies from 380 to 560 lbs. There is little margin for any additional load to be applied to the ceiling. If a mechanic, weighing 200 lbs., were to stand on the ceiling next to a wire hanger, he would add an additional load of 200 lbs. to a tab which already had a load of 200 lbs. This would bring the total load on a tab to 400 lbs., which is in the failure range of the tabs.

In our opinion, this is exactly what happened. The observations at the site indicate the actual breaking of tabs prior to the collapse on August 8, 1983. When a tab fails, the load it was carrying is transferred to other adjacent tabs, which are already significantly loaded.

By analysis of the rust on the tab fracture surfaces, 24 metal tabs had previously failed in the south end of the ceiling prior to August 8, 1983. These represented about half of the loaded tabs supporting the ceiling in the area of a sag. Analysis also indicates that five of the wire hangers which had previously been connected to these tabs had been reconnected to adjacent, unbroken tabs. Reconnecting a wire hanger, however, does not necessarily mean that the wire hanger picks up its share of the load. Some tabs were near their breaking capacity based on previous load transfer from the failure of other tabs. Prior to August 8, 1983, the probability of failure was significant if additional loads were placed on the ceiling.

On August 8, 1983, when a mechanic stepped onto the ceiling to start repair work, his weight caused one more tab failure, transferring both the weight of the ceiling at this point plus the weight of the mechanic to other already highly overloaded tabs. The additional load transfer could not be accommodated by the other tabs in the area and as the tabs sequentially failed, the rate and magnitude of load transfer increased throughout the entire ceiling, causing the total collapse. Since the main runner channels and furring channels created a continuous grillage, this transfer of load was possible throughout the entire ceiling area.

The primary cause which initiated this failure occurred during the design and construction phase of the JSTC project. In our opinion, a specific restriction in the specifications and shop drawings under one contract for the steel deck, limiting the load that could be applied to the tabs, was not properly coordinated with another contract for the construction of the ceiling. Why this coordination did not properly occur is a subject of the ongoing investigation.

The specifications for the metal deck prepared for the project stated that loads not greater than 60 lbs. per tab should be utilized on the deck tabs in the area of the concourse ceiling. The final approved metal deck shop drawings, as prepared by the deck manufacturer, show notes stating the 60-lb. load limitation on the tabs, and thus were compatible with the specifications. In addition to the standard printed notes, a hand-lettered note on the shop drawings stated that "If hanger tabs are used to hang plaster ceilings sufficient tabs must be used to limit load to 60 lbs. on any one tab". (Note that this load limitation is approximately 1/6 to 1/9 of the tested capacity of the tabs.)

B. CEILING CONSTRUCTION

Our review of standard industry practices for the construction of suspended cement plaster ceilings has not been completed. However, we have reached several opinions based on our preliminary findings.

The combination of cement plaster, lath, channels and wire hangers as installed at JSTC has represented an acceptable industry practice for suspended cement plaster ceiling construction for many years before 1969 and currently.

It was also an acceptable industry practice in 1969, when the design of the project began, as well as currently, to use metal deck tabs for the purpose of accommodating the installation of work of other trades under the deck, such as to suspend lightweight acoustical panel type ceilings, and sheet metal duct systems. Whether or not the hanging of cement plaster ceilings from metal deck tabs was an acceptable industry practice is not clear. There may be different opinions on this among different elements of the building industry. Investigation into this issue is continuing.

There is no restriction in the applicable building code, at the time of the project or now, which prohibits this type of construction. The BOCA (Building Officials Conference of America) Code is the applicable building code.

Although the basic concept for the ceiling construction was not in violation of the applicable building code, a particular strength requirement in a code reference standard was not observed. The reference standard requires that the inserts or anchors in a concrete slab (the connection between the slab and the hanger) should be able to "develop the full strength of the hangers" attached to them. The strength of the tabs, based on LPI testing, is approximately one third the strength of the Number 8 gage wire which was attached to them (approximately 500 lbs. vs. 1,400 lbs.)

There were other very minor variances from the code reference standards which had nothing to do with the failure. These are described in Section VII.

There is nothing in the applicable BOCA Code at the time of the project stating a specific requirement for providing expansion joints in cement plaster ceilings and its supporting grillage. The industry practice concerning expansion joints in suspended cement plaster ceilings is not clear and is still under investigation.

As stated above, the ceiling was constructed with a continuous grillage suspension system. That is, there were no expansion joints in the suspension system. Joints were installed in the cement plaster finish and lath. It should be noted, however, that the reason for the installation of expansion joints is to accommodate initial shrinkage of the cement mortar and cyclical temperature effects of the ceiling assembly, not to prevent a total collapse.

C. TECHNICAL DEFICIENCY

In our opinion, the following is the deficiency during the original design and installation of the ceiling that initiated the collapse on August 8, 1983:

The metal deck tabs did not have sufficient strength to provide an adequate factor of safety, based on the spacing of the hangers utilized, for the weight of the ceiling and additional live loads, such as the presence of mechanics on the ceiling, which is considered customary. The connection of the hangers to the tabs did not meet a strength requirement of a reference standard of the applicable Building Code, which requires that the connection to the slab be as strong as the wire hanger.

III. PROJECT AND CONSTRUCTION DESCRIPTION

A. GENERAL DESCRIPTION OF THE JSTC

The JSTC contains the following facilities:

1. The entrance to the Journal Square PATH Station and other PATH System Ancillary Services.

2. A bus terminal

3. A parking deck

4. An office building

5. The street level plaza, and underground concourse, which are bounded by retail stores and passenger service facilities.

The JSTC is constructed over the PATH System train tracks, which are in a rock cut area in Journal Square, in downtown Jersey City, New Jersey.

Drawing 1 in Appendix A, is a schematic floor plan at the concourse level.

Drawing 2 in Appendix A, is a reflected Framing Plan of the Plaza Floor Construction which supported the ceiling that collapsed.

Drawing 3 in Appendix A, is a cross section which indicates the spatial relationships of the JSTC in the area of the ceiling construction.

Drawing 4, 5 and 6 in Appendix A, are schematic representations of the suspended cement plaster ceiling construction.

B. DESCRIPTION OF SUSPENDED CEILING CONSTRUCTION AND CONNECTIONS

A suspended cement plaster ceiling is an assembly of components which perform specific functions. These components are shown in Drawings 4, 5 and 6 in Appendix A.

1. Cement Plaster

The cement plaster is the finish material of the assembly. Cement is the binding agent in the plaster finish material. It is used for exterior finishes as it is not subject to moisture deterioration as would occur if a gypsum binder was used.

2. Lath

The cement plaster finish is applied to rigid perforated metal which is referred to as lath. The perforations allow the plaster to key into the lath and create a secure bond.

3. Furring Channels

In order to maintain a rigid flat plane for the lath, the furring channels are secured by wire to the lath at a relatively close interval, usually 12 inches on center, which was the case at JSTC.

4. Main Runner Channels

The main runner channels support the cement plaster and the gypsum lath. They are placed and secured by wire and are perpendicular in direction to the furring channels. They are usually spaced at intervals of 4-foot to 5-foot on center. The typical spacing at JSTC was 4-foot on center.

5. Wire Hangers

The above ceiling construction is suspended from wire hangers which are attached to the floor construction above and the main runner channels at the ceiling level. They are usually spaced in a grid at 4 feet to 5 feet on center. At JSTC a 4-foot grid was typical.

6. Metal Deck

At JSTC the wire hangers were typically attached to tabs prepunched in the metal deck. These tabs are typically provided to allow other trades to hang their materials from the metal deck. The metal deck is also utilized both as structure and to provide a form for the pouring of the concrete floor slabs of the plaza.

IV. OBSERVATIONS, INSPECTION AND TESTING

A. INITIAL OBSERVATIONS

On the afternoon of August 8, 1983, the day of the collapse, the following observations were made at the site by LZA personnel.

1. There was a total collapse of the concourse level suspended cement plaster ceiling between the south, east and west walls surrounding the entrance well to the PATH System. The ceiling was of typical suspended cement plaster ceiling construction, as shown in Drawings 4 and 5 in Appendix A.

2. The wire hangers had typically been attached to metal deck tabs from the deck at the Plaza level, approximately 8 1/2 ft. above the Concourse ceiling. The wire hangers were spaced in a grid of approximately 4 ft. x 4 ft. on center.

3. Throughout the area of the collapsed ceiling, the typical failure which was observed was the fracture

of metal deck tabs. In a few cases, some wire hangers were observed to be still hanging from the metal deck above. Some were broken while others were observed to be supporting some of the main runner channels (from which the ceiling had separated). These were observed to be isolated cases and not the typical mode of failure.

4. Varying degrees of corrosion on the tabs were observed. In general, the corrosion seemed heavier in the south-end of the concourse area than in the north, east and west sections. The corrosion of the tabs also seemed to increase near the sump pans in the metal deck. The plaza drains were connected to a suspended drain pipe above the cement plaster ceiling. The pipe was not supported from the metal deck tabs.

5. Located in an area of approximately 15 ft. by 40 ft. at the south-end was a concrete slab forming the plaza planter above (see Drawings 2 & 3 in Appendix A). Here the hangers were connected by concrete studs into the slab. Most of the studs had pulled out of the concrete. Some stud clip

connections failed by tearing. There was no evidence of any significant corrosion in this area.

6. Of special interest was the observation that at the south-end there were some areas where two (2) adjacent metal deck tabs were fractured. Although these deck tabs might have been within 6 to 8 inches from each other, there was only 1 wire hanger in this vicinity on the collapsed ceiling below.

   This indicates that this wire hanger may have been reattached to one of these tabs after the other tab had fractured.

7. At the time of our observation most of the collapsed ceiling in the south-end had not yet been removed. The cement plaster finish was approximately 3/4 of an inch to 1-inch thick on wire lath supported by 1-inch-high furring channels spaced at approximately 1 ft. on center. There were main runner channels, 1-1/2-inch-high, spaced approximately 4 feet on center. The wire hangers were connected to the runner channels approximately

every 4 feet. There was an access hatch at the south east end of the ceiling. The runner and furring channels were overlapped at their edges and wrapped with wire and splice plates to obtain a continuous framing member.

8. Two (2) expansion joints were constructed through the plaster and the lath. The main runner channels were continuous through the two (2) expansion joints. Therefore, there were no expansion joints in the suspension system grillage. Other joints that were observed were control joints in the cement plaster finish only, and not through the lath.

9. The initial observations suggested the possibility that the failure was due to the corroding metal deck tabs. As the tabs fractured due to corrosion, additional load would be transferred to the other hangers and tabs. This process of load transfer could eventually cause a total collapse. However, as discussed below, a more detailed inspection and testing of the tabs indicated that corrosion was not the cause of failure.

B. INSPECTION AND TESTING

Based on the above observations of the condition of the metal deck, the firm of Lucius Pitkin, Inc. was engaged to provide detailed field inspection reports and provide testing and metallurgical consultation services. LZA developed the scope of this program as follows:

1) On-site testing to determine the strength of the metal deck tabs, comparing the strength of corroded tabs to the non-corroded tabs.

2) Detailed inspection and measurements to determine the degree of corrosion on tabs.

3) Load testing on 3 studs remaining inbedded in the area of the concrete planter.

4) Load tests on hanger wires to determine their strength.

5) Test and measurements to determine the typical weight of the ceiling and to verify the size and

weight parameters of the ceiling components.

6) Photographic and metallographic examinations on the metal deck tabs and the wire hangers, in order to determine the probable cause of tab and hanger fractures.

7) Thorough visual examination of the metal deck, to identify and locate the fractured metal deck tabs, the remaining hanger wires, and the concrete-imbedded studs.

A complete report of the inspection, testing and metallurgical analysis by Lucius Pitkin, Inc., (LPI) is attached as Appendix B. The following summarizes their observations, test results and conclusions.

1) Visual Examination

There were approximately 24 metal deck tabs in the south end that exhibited corroded fracture surfaces, indicating that these tabs had failed prior to the collapse of the ceiling on August 8, 1983. Typically, all the remaining metal deck fractured tabs exhibited a relatively bright shear type of fracture at the mid length of the tab. This indicated that these tabs had fractured at the time of the ceiling collapse. Figures 10, 11 and 15 to 18 in the LPI Report are close-up photographs showing a recently fractured metal deck tab as compared to an "old" fractured tab.

Of particular importance was the observation that recent and old fractured tabs were immediately adjacent to each other on the north side of the drain pipe in the south portion of the ceiling. These were the same fractured metal deck tabs which were observed on the afternoon of August 8, 1983 to be close to each other with only one corresponding wire hanger on the collapsed ceiling below. These are also in the general area of an access hatch.

Because of these field observations, a reflected plan of the metal deck south of the Path entrance well was prepared. The drawing was prepared principally to identify and locate the different types of fractured metal deck tabs, the remaining hanger wires, and the concrete imbedded studs.

This diagram is shown in Figure 1 of the LPI Report.

There were some other areas where the metal deck tabs appeared to have been broken by mechanical means, probably during the construction phase. In one area, some wire hangers were observed to be still attached to the metal deck and appeared to have been recently cut, probably when removing the collapsed ceiling.

One 0.147 inch diameter (9 W & M gage) hanger wire was found still attached to a deck tab in the location of the access hatch (location 10 E.14 on Figure 1 of Appendix B). The wire exhibited a bright clean torsional shear fracture, free of "necking down", but showing that a twist had occurred in the wire surface immediately adjacent to the fracture. Observations indicated that there had been a loop approximately at the mid-length of this wire. Also, from looking at the connection of the wire to the tab above, it seemed to have been reattached at one time.

2) Tab Thickness Measurements

Thickness measurements were taken on approximately 100 fractured metal deck tabs throughout the area of the ceiling collapse. Measurements were made on heavily corroded tabs, less corroded and non-corroded tabs. The tab thickness varied from 0.027 inches on the heavily corroded tabs to 0.032 inches on the non-corroded. The corroded tabs were generally near the south wall, and the uncorroded tabs were toward the north.

3) Load Tests on Tabs

Load tests on the metal deck tabs indicated that fracture occurs at loads ranging from 380 lbs. to 560 lbs. There is no apparent correlation with respect to the degree of corrosion (deck tab thickness) and it's strength (load capacity). (For example, one specimen, 0.027 inches thick, failed at 430 lbs. and another specimen, 0.030 inches thick, also failed at 430 lbs.).

4) Imbedded Concrete Studs

Load tests on the concrete studs still imbedded in the concrete slab under the planter exhibited load capacities ranging from 950 to 1300 lbs.

5) Hanger Wire Tests

Tensile strength tests on hanger wires exhibited average breaking strengths of 1180 and 1450 lbs., respectively, for the 0.147 inch (9 gage) and the 0.161 inch (8 gage) diameter wires. In an attempt to duplicate the fracture appearance of the broken wire tied to the unbroken tab at location 10E.14, adjacent to the access hatch, specimens of the same size wire, 0.147 inches in diameter, were tensile tested after looping the wire at the mid-length. These tests resulted in breaking strengths varying from 420 to 480 lbs., which are similar to the breaking strengths of the tabs. This explains why this wire had still remained attached to a tab.

6). Ceiling Weight Determination

Testing a portion of the mezzanine level suspended ceiling, which was visually similar to the ceiling at the concourse level, indicated that the weight of the cement plaster, lath and channels is 11.6 lbs. per sq. ft.

7) Conclusions Based on the Lucius Pitkin Report:

a) The initiation of the suspended ceiling collapse was a result of the localized overloading of the metal deck tabs adjacent to the south wall. The failure of these tabs triggered a succession of failures in adjacent deck tabs and in concrete studs. Examination of the connection of the looped wire near the access hatch, and the evidence of new fractures versus old fractures adjacent to each other near the south-end, indicate the probability that there could have been a failure of some tabs and a relocation of five hanger wires to adjacent tabs after the initial installation of the ceiling and prior to the collapse.

b) The metal deck tab load tests, the thickness measurements and the metallurgical examination showed that the extent of corrosion was slight and could not have reduced the metal deck tab strength significantly enough to be a contributing factor in initiating the collapse of the ceiling. The 24 old fractured tabs could possibly have occurred more than a year prior to the collapse of the ceiling.

V. ANALYSIS

A. LOADS AND DEFLECTIONS

The cement plaster ceiling weighs approximately 12 lbs. per sq. ft. Therefore, with the supporting hangers on approximately a 4 foot by 4 foot grid, this would result in approximately 200 lbs. of load per tab just due to the weight of the ceiling construction (dead load).

The strength of the tabs ranged from 380 to 560 lbs., with an average strength of about 460 lbs. A 200-lb. man standing next to a hanger, in combination with the ceiling dead load, would cause a total load on the tab of about 400 lbs., assuming all hangers were attached and bearing load. This is the order of magnitude of a failure load. If someone were to walk or work in the ceiling, this does not leave any significant margin for safety.

A computer model was developed to determine the behavior of the suspended ceiling and the force distribution in the hangers in the section of the ceiling between Column Lines N to O and 46 to 44 (see Figure 1, page 36). This is the section of the ceiling where "old" and "new" fractured tabs were found adjacent to each other, as described in Section IV.

A mathematical model of this area was constructed using 603 rectangular isoparametric elements. The element equivalent thickness was derived from the stiffness of the 1.5 inch-high steel main runner channels in one direction and the 1-inch high steel furring channels in the other direction which, together, make up the composition of the ceiling. The appropriate boundary conditions were applied to the model to simulate continuity of the plate. At each hanger location a vertical support was introduced to simulate the hanger. The general purpose finite element analysis program TPS-10 was utilized for the analysis.

Hanger locations were varied in order to simulate both the "as-built structure" and the "as-existing structure prior to collapse". The "as-built" model assumes all of the hangers are connected, as shown in Figure 1. The "as-existing model prior to collapse" assumes none of the hangers associated with "old" fractured tabs are engaged to the metal deck tabs, as shown in Figures 2 and 3 on pages 37 and 38).

The results of the finite element analysis for the "as-built structure" are summarized in Figure 1. The maximum tensile force in a hanger was calculated to be 228 lbs. The maximum deflection of the ceiling between hangers was calculated to be 0.2 inches.

The results of the finite element analysis of the model for the "as existing structure prior to collapse" are summarized in Figure 2. The maximum tensile force in a hanger was calculated to be 785 lbs. The maximum deflection of the ceiling was calculated to be 1.9 inches. Note that Figure 2 shows the anticipated loads on remaining tabs, assuming that all the "old" fractured tabs had already occurred.

Hand calculations for deflection of the cantilevered ceiling area (after old fractures of tabs occurred) adjacent to Column line 46 and between Column Lines O and Q indicate an expected deflection of approximately 4 inches (see Figure 4, page 39).

The calculated deflections take into account the stiffness of the main runner channels in one direction and the furring channels in the other direction, and do not consider the additional stiffness which could occur due to the composite action of the cement plaster and lath. This composite action would not normally be considered in the structural analysis. However, this indicates that the calculated deflections could be slightly higher than the actual deflections which would be observed.

However, the model assumes continuity of runner and furring channels and lateral bracing of channels, both of which are approximations. This could make calculated deflections lower than actual deflections. The model may give very approximate deflections. The forces in the hangers and the overall behavior of the ceiling are a realistic representation.

Figure 3 shows the anticipated situation after hangers were reattached sometime prior to the collapse. It should be noted, however, that once a hanger tab has broken and a deflection has occurred, reattachment of this hanger to another tab does not necessarily cause the hanger to take any load. In order for the reattached hanger to take load, some procedure to tighten the hanger would have to be implemented. When a hanger is reattached without a procedure to tighten it, and thus is not taking any load, overload in other hangers is not relieved. Thus Figure 3 indicates the same loads and deflections as Figure 2.

Load Distribution at Time of Collapse

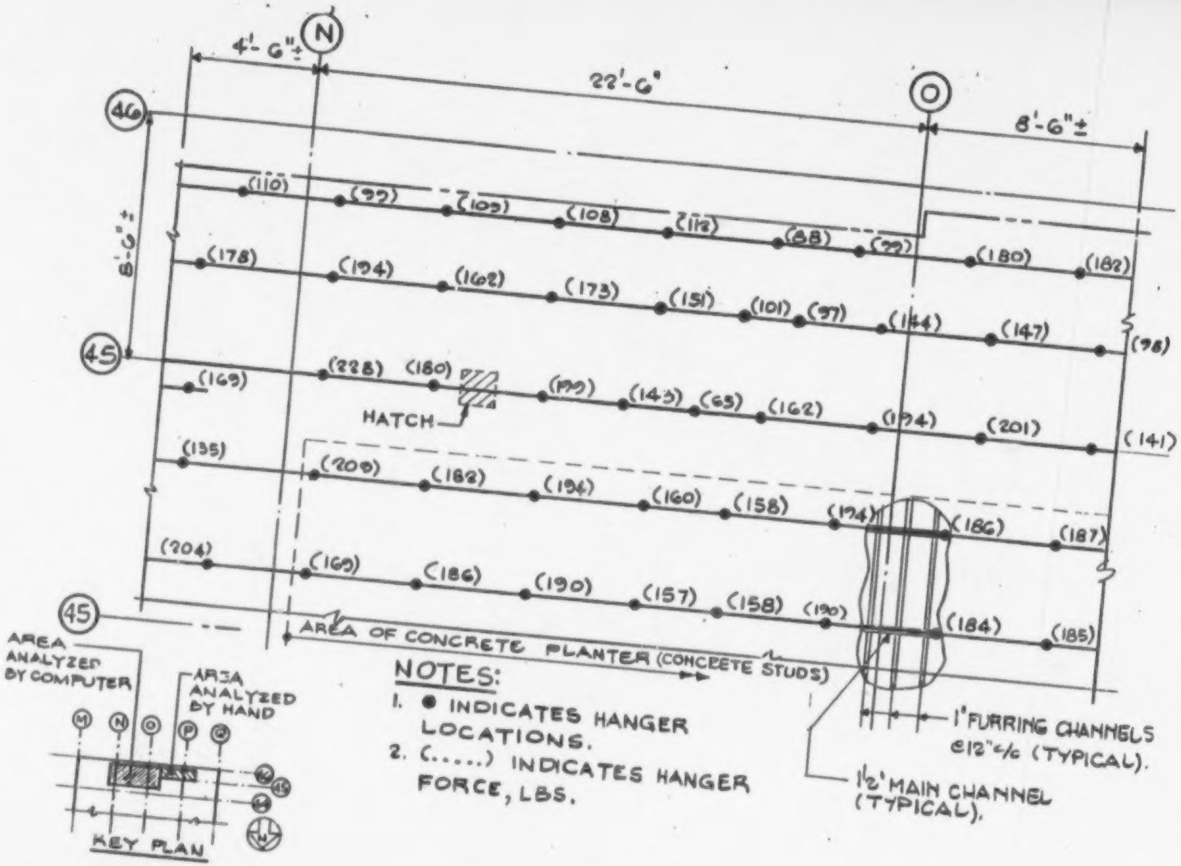
A study of Figures 2 & 3 indicates that any additional load, such as a mechanic walking on the ceiling, could possibly cause a tab fracture which could start a total collapse. The highest load on a tab indicated in Figure 4 is 785 lbs., just south of the access hatch. This is larger than the failure range of the tabs (380 to 560 lbs.). Most probably this tab started yielding at a load in the 500-lb. range, and the additional load of 285 lbs. was redistributed to adjacent tabs. In any event, it is apparent that the ceiling was sensitive to any additional load.

Therefore, when a man walked into the ceiling on August 8, 1983, it is likely that he stepped near a highly loaded hanger, causing the connecting tab to fail. That shifted his weight (say 200 lbs.) and the load that the hanger was taking (say an additional 500 lbs.) to adjacent hangers which may also have had loads in the order of 300 to 500 lbs. As additional tabs failed, the magnitude and rate of load transfer increased, causing a rapid transfer of load throughout the ceiling.

B. TECHNICAL CAUSE OF FAILURE

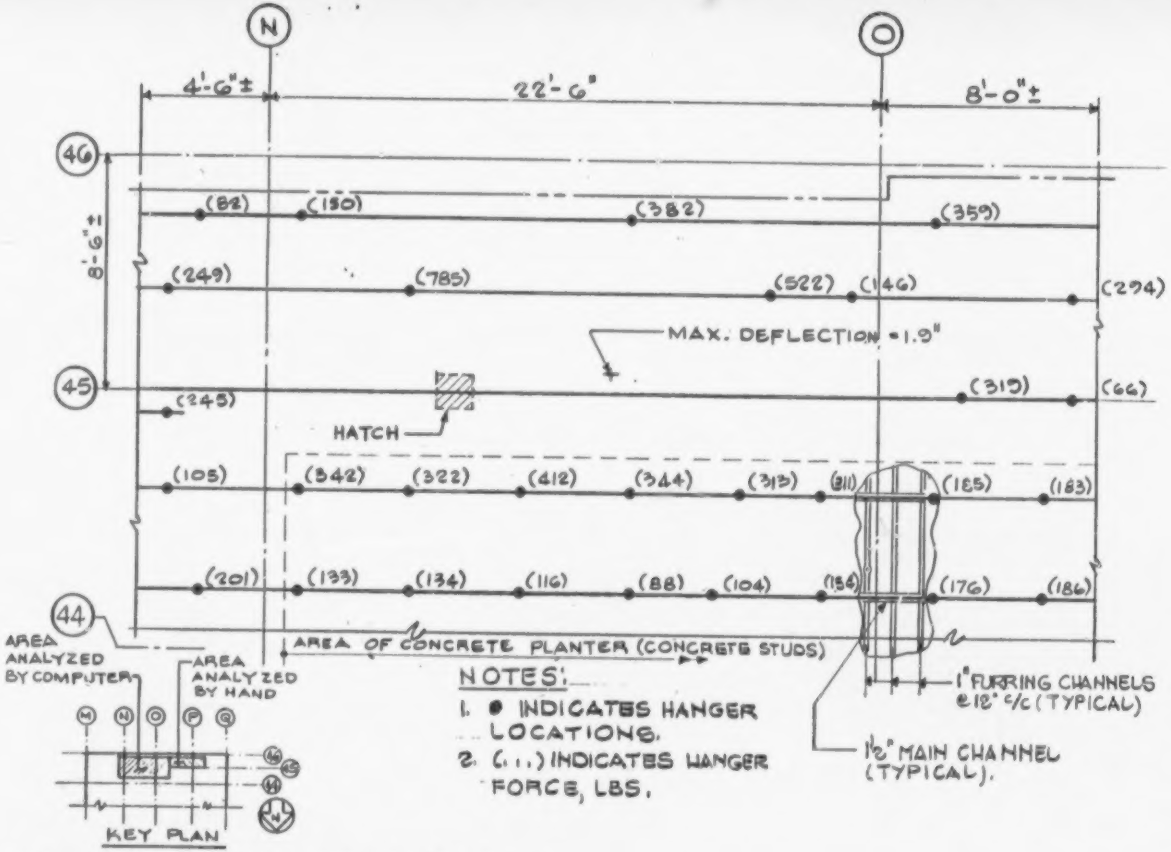
The following is concluded. The initial cause of failure was an overload of the metal deck tabs, which supported the hangers that supported the ceiling. Tabs were broken prior to August 8, 1983. They could have possibly failed more than a year before August 8, 1983. The additional load of men working in the ceiling was enough to initiate failure of the tabs. Failure of a tab transferred additional load onto other tabs.

On August 8, 1983, the additional load from someone entering the ceiling caused an additional failure of a tab, which consequently shifted more load to already overloaded tabs and started the progressive collapse. The progressive total collapse of the ceiling was possible because of the continuous nature of the ceiling suspension system grillage.


4'-6"±
N
22'-6"
O
8'-6"±
46
8'-6"±
45
45
(110)
(99)
(109)
(108)
(112)
(88)
(99)
(180)
(182)
(178)
(194)
(162)
(173)
(151)
(101)
(97)
(144)
(147)
(98)
(169)
(228)
(180)
(199)
(143)
(65)
(162)
(194)
(201)
(141)
HATCH
(135)
(209)
(182)
(194)
(160)
(158)
(194)
(186)
(187)
(204)
(169)
(186)
(190)
(157)
(158)
(190)
(184)
(185)
AREA OF CONCRETE PLANTER (CONCRETE STUDS)
AREA ANALYZED BY COMPUTER
AREA ANALYZED BY HAND
M
N
O
P
Q
46
45
44
KEY PLAN
NOTES:
1. ● INDICATES HANGER LOCATIONS.
2. (.....) INDICATES HANGER FORCE, LBS.
1" FURRING CHANNELS @12" o/c (TYPICAL).
1½" MAIN CHANNEL (TYPICAL).

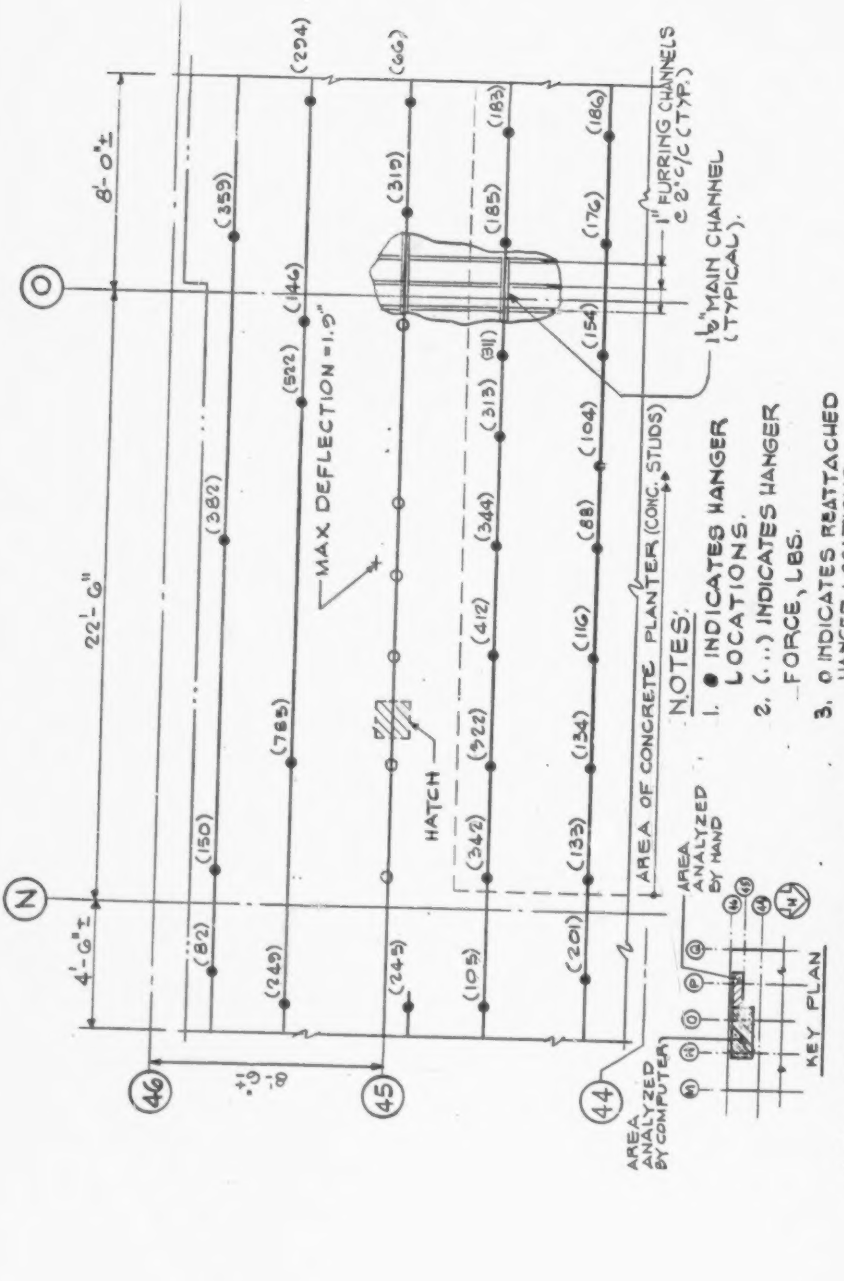
AS - BUILT CONDITION

FIG. 1


N
O
4'-6"±
22'-6"
8'-0"±
46
45
44
8'-6"±
(82)
(150)
(382)
(359)
(249)
(785)
(522)
(146)
(294)
MAX. DEFLECTION = 1.9"
(245)
(319)
(66)
HATCH
(105)
(342)
(322)
(412)
(344)
(313)
(311)
(185)
(183)
(201)
(133)
(134)
(116)
(88)
(104)
(154)
(176)
(186)
AREA ANALYZED BY COMPUTER
AREA ANALYZED BY HAND
AREA OF CONCRETE PLANTER (CONCRETE STUDS)
1" FURRING CHANNELS @12" c/c (TYPICAL)
1½" MAIN CHANNEL (TYPICAL).
KEY PLAN
M
N
O
P
Q
46
45
44
NOTES:
1. ● INDICATES HANGER LOCATIONS.
2. (...) INDICATES HANGER FORCE, LBS.

AS-EXISTING CONDITION:
'OLD' FRACTURED TABS DISENGAGED

FIG. 2


4'-6"±
22'-6"
8'-0"±
N
O
46
45
44
8'-6"±
(82)
(150)
(382)
(359)
(249)
(785)
(522)
(146)
(294)
(245)
(319)
(66)
(105)
(342)
(322)
(412)
(344)
(313)
(311)
(185)
(183)
(201)
(133)
(134)
(116)
(88)
(104)
(154)
(176)
(186)
MAX DEFLECTION = 1.5"
HATCH
AREA OF CONCRETE PLANTER (CONC. STUDS)
1" FURRING CHANNELS @ 2'c/c (TYP.)
1½" MAIN CHANNEL (TYPICAL)
AREA ANALYZED BY COMPUTER
AREA ANALYZED BY HAND
KEY PLAN
M
N
O
P
Q
44
45
46

NOTES:

1. ● INDICATES HANGER LOCATIONS.
2. (...) INDICATES HANGER FORCE, LBS.
3. ○ INDICATES REATTACHED HANGER LOCATIONS.

AS-EXISTING CONDITION:
HANGERS REATTACHED

FIG. 3

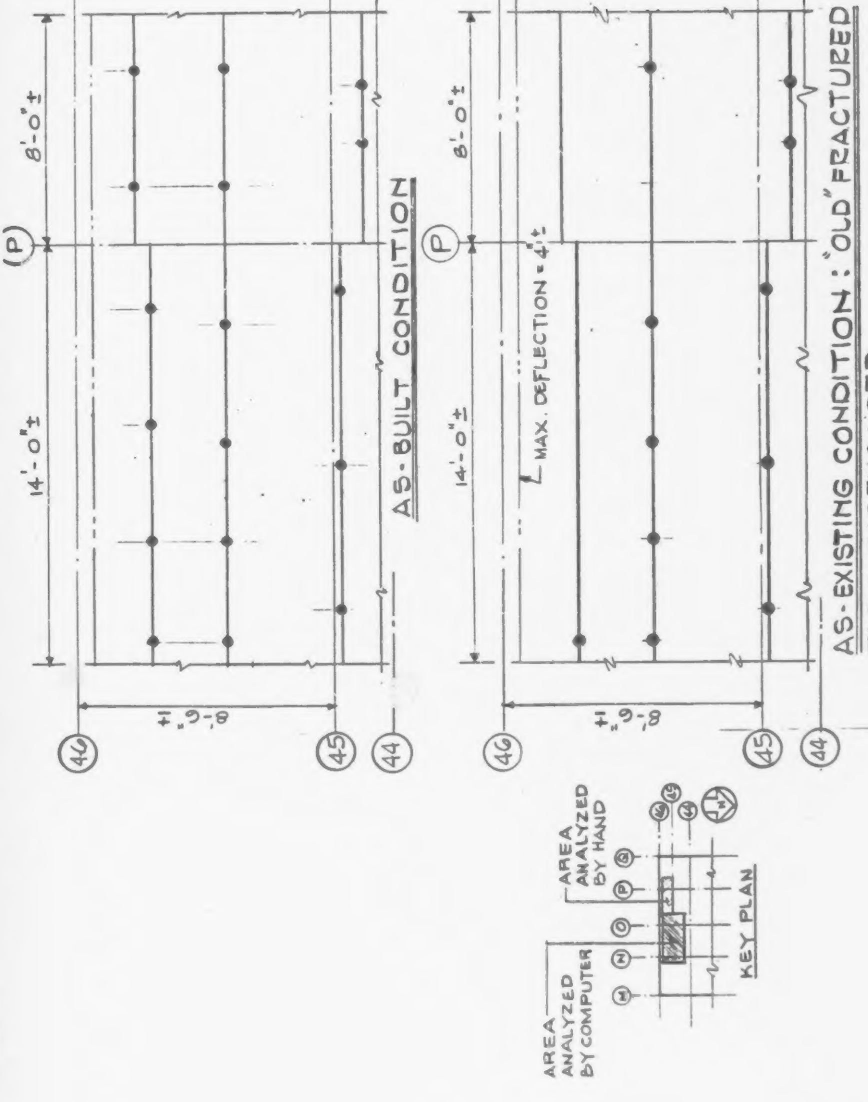

14'-0"±
8'-0"±
(P)
8'-6"±
(46)
(45)
(44)
AS-BUILT CONDITION
14'-0"±
8'-0"±
(P)
MAX. DEFLECTION = 4"±
8'-6"±
(46)
(45)
(44)
AS-EXISTING CONDITION: "OLD" FRACTURED TABS DISENGAGED.
AREA ANALYZED BY COMPUTER
AREA ANALYZED BY HAND
(M)
(N)
(O)
(P)
(Q)
(46)
(45)
(44)
KEY PLAN

FIG. 4

VI. REVIEW OF DOCUMENTS

A list of all documents reviewed will be included in the final report.

In order to evaluate the construction of the ceiling, first a review of the material prepared by the Architect and his engineering consultants is required. The Architect conveys his design and construction intent by working drawings and specifications that are referred to as contract documents.

A. GENERAL

Working drawings are prepared to "depict graphically the characteristics and extent of the project". In general, the drawings are prepared in order to provide the information necessary to determine the construction cost of the work and the general means of assembling building components to achieve the actual construction. Working drawings should thus show what materials are involved, where they are located, and what their physical dimensions are.

Written specifications define the level of performance that the materials are required to meet. Specifications state what the materials are, how they are to function, and which manufacturers may provide an acceptable product.

B. REVIEW OF WORKING DRAWINGS

The working drawings supplied to LZA by the PANYNJ are dated as being issued on February 15, 1971. The drawings are also indicated to be an "as-built" set, as of August 17, 1976.

Drawings TA-1 through TA-73 were prepared for the construction of the JSTC PATH Train Station, Garage, Bus Terminal and Consumer Service Facilities.

Drawings AA-1 through AS-18 were prepared for the construction of the Office Building.

The other drawings in the set were prepared by the consulting engineers for the Architect relative to the project's structural, heating, ventilating, air conditioning, plumbing, fire protection and electrical trades.

Architectural Drawing Review

From the working drawings set, we have selected specific drawings which relate to the ceiling construction.

Drawing TA-3, Concourse Reflected Ceiling Plan, contains the following information:

a. It indicates the extent of the suspended cement plaster ceiling.

b. It also shows details of the construction of the curved cement plaster lighting cove and the transition details between the cement plaster and the acoustical tile ceiling, which was used for the remainder of the concourse ceiling construction.

c. It shows the division of the ceiling by a two way grid of expansion joints every 10 to 12 feet whose construction is indicated by the following note:

"#40 zinc exp. jt. set at 1/4" and typ."

The above note does not refer to a detail which would graphicaly show the design intent. In our opinion, it is not clear whether the 1/4-inch joint is to be constructed as an expansion joint through the ceiling support grillage, or as a 1/4-inch expansion joint in the cement plaster finish only.

d. Detail 2 on Drawing TA-3 indicates the construction of a 1-inch expansion joint in the cement plaster ceiling and through the supporting grillage at the edge of the box girder and the lighting cove.

e. Detail 3 on Drawing TA-70 indicates the expansion joint in the cement plaster ceiling and through the supporting grillage which occurs at the edges of box girders.

In reviewing the details throughout the set there is a general consistency in the graphic representation.

1. In other areas of the project, expansion (or control) joints, are referenced to details, marked as typical, which indicate a complete separation through the

cement plaster, lath, and the supporting furring and main runner channels, with dual hangers to be provided.

2. The details of the ceiling construction throughout the set do not indicate the attachment of the hanger wire to the structural slab. This is, however, in conformance with accepted industry practice in showing suspended ceiling construction. The hanger connection is addressed in this project in the specifications, which is customary.

3. The details do not in general indicate the spacing or the weight of the supporting elements since these items are also addressed in the specifications.

In conclusion, it is our opinion that there was sufficient information in the plans for adequate construction of the suspended cement plaster ceiling, with the exception that the expansion joint which is shown every 11 to 12 feet in both directions in the concourse ceiling is not clearly defined. The drawings are ambiguous as to whether this joint is just in the cement plaster, or also through the supporting grillage.

Since the type of expansion joint that was to be constructed is not specifically detailed and since the question of industry practice concerning expansion joints is unclear, the adequacy of the expansion joints as shown on the drawings and how the industry would interpret their representation on the drawings is part of the ongoing investigation.

C. SPECIFICATIONS

The sections of the specifications that pertain to the construction of the suspended cement plaster ceiling and metal deck are:

1. Section 33, Steel Floor and Roof Deck (Contract PAT-250.024 DOT-UT-6), pages 137 through 138.

2. Section 34, Steel Floor and Roof Deck (Contract PAT-250.025 DOT-UT-6), pages 139 through 141.

3. Section 65, Furring and Lathing, (Contract PAT-250.032/033) pages 349 through 353.

4. Section 66, Plastering, (Contract PAT-250.032/033) pages 354 through 361.

Metal Deck

Section 33 and 34 of the specifications are for the same material. They are separate sections because they are used in different areas of the project that were constructed with different sources of funding.

The specified metal deck in Section 33 is .Profile QL-3 Steel Roof and Floor Deck, 1-1/2-inch-deep, types section 3, as manufactured by H.H. Robertson Co. of Pittsburgh, Pa.

The specified metal deck in Section 34 is Profile QL-3 and QL-UKX Steel Roof and Floor Deck, 1-1/2-inch-deep, types section 3, as manufactured by H.H. Robertson Co.

The design of these metal deck sections is for composite construction, which requires a pattern of deformations to provide a structural bond between the deck and the concrete slab.

Both Section 33 (page 138) and Section 34 (page 140) contain the following paragraph:

> "The cellular and fluted steel floor sections shall have the low horizontal element punched between cells to provide Q-hanger slots for use by other builidng trades. The hanger slots shall be located to provide maximum flexibility for other trades, and must be approved by the Underwriters' Laboratories, Inc."

Section 34, which applies to the plaza deck which supported the wire hangers for the concourse ceiling, also contains the following paragraph:

> "Maximum load per hanger tab in cellular panels (Office Building) is 100 lbs. Maximum load per hanger in fluted panels (Plaza Area) is 60 lbs. Loads are based on No. 8 gage wire hanger."

Furring and Lathing

The specified materials for the construction of the suspended cement plaster ceiling are generally consistent with industry accepted standards and the applicable building code. The specification does indicate that the runner channel can be a 1-1/2-inch hot rolled section weighing 0.85 pounds per lineal foot instead of the 1.12 pounds required by the governing Building Code; however, this is of no substantive significance. (See section VII)

The following paragraph from Installation, page 351 in Section 65 of the specification, states:

> "Inserts, anchors and wires necessary to secure and support suspended ceilings and metal furring shall be set in forms before concrete is poured, wherever possible. Where attachment to precast, structural concrete, structural steel, or other construction is required and anchors or inserts have not been provided, the type of fastening proposed shall be subject to approval by the Engineer."

From Section 34 of the specification, it is our opinion that the specifications were prepared with the design intent that the metal deck tabs can be utilized "by other building trades." However, it does not specifically state what is to be hung from these tabs.

As stated above, the metal deck specification in Section 34 indicates the maximum loads per tab. The purpose of this specification, however, is to define the metal deck and the tabs.

It is not customary to use one section of a specification to communicate load limitations to other trades that are building according to another section of the specification. The best place to do this is in the specification which applies to that trade.

For example, one section of the JSTC specification for the lightweight acoustical ceilings used throughout the Office Buildings specifically states that hangers should not be subjected to more than 100 lbs. of load. This is compatible with the 100-lb. maximum tab load specified in section 34 for the Office Building deck.

However, the Furring and Lathing specification, Section 65, does not state a load limitation on the hangers for suspended plaster ceilings. This is so because this specification is customarily written to give contractors flexibility in selecting the types of anchor or inserts to be used to support the hangers. This specification also gives a contractor flexibility in using either a 4-foot or 5-foot spacing between hangers, which choice would affect the load in the hanger as well as the type of hanger to be used. Therefore, it would not be customary to see a load limitation on hangers in this Furring and Lathing specification for the suspended plaster ceiling.

From the above analysis we conclude the following:

1. The specifications provide for metal deck with tabs for the use of other trades.

2. The tabs were to be used for hanging the acoustical ceilings throughout the complex.

3. The specification regarding the Furring and Lathing, for the suspended plaster ceilings, Section 65, allows options to the contractor for choosing anchors or inserts to connect hangers to the deck. According to Section 65, the contractor is instructed to set

anchors and inserts in forms before concrete is poured, "wherever possible."

It is possible to set anchors or inserts in concrete with the deck specified. Holes could be drilled in the deck and anchors could be set through these holes to be cast into the concrete poured onto the deck.

However, the contractor might assume that if the deck is provided with tabs, he has the option of using them. In our opinion, this is a reasonable conclusion.

4. We see nothing within either of the above sections of the specifications that contributed to the cause of the collapse. We conclude, however, that they permit the use of tabs for hanging the cement plaster ceiling only as long as the load limitations are adhered to.

D. SHOP DRAWINGS

Shop drawings are prepared by contractors and suppliers prior to fabrication and installation of materials. The purpose of shop drawings are: 1.) To show in larger scale what the actual component is; 2.) to co-ordinate the inter-face of the component with other components of the construction; and 3.) to verify that the component meets the quality established in the specification.

Before a product is fabricated and installed, approval by the Architect/Engineer is required. This is obtained by having the supplier forward his shop drawings to the Contractor, who reviews and forwards them to the Architect/Engineer. Often, there are several submissions before a final set is approved.

The shop drawings pertinent to this report are those for the steel deck, and, the suspended ceiling metal lathing and furring.

The metal deck shop drawings were prepared by the metal deck manufacturer. There were several revisions of the drawings. The first submittal was dated August 8, 1971, and the last revision issued was dated July 20, 1972. The approval stamp on the drawing indicates that the Architect approved the drawings on August 7, 1972.

On drawing ED-1 there is a set of pre-printed general notes. One group of these notes is headed "Caution". The third note of this group states:

> "The maximum allowable static load per hanger tab load shall be 60 lbs. with a minimum hanger wire size of #8..."

On the same drawing there is a lettered note stating the following:

> "NOTE A"
>
> "If hanger tabs are used to hang plaster ceilings sufficient tabs must be used to limit load to 60 lbs. on any one tab."

Both of these notes were added to the shop drawings on the third (3rd) revision, which was issued on February 10, 1972.

In reviewing the shop drawings, it is apparent that the manufacturer was aware that the tabs may be used for a suspended plaster ceiling. It is also apparent that the

Architect was advised of the load limitation on the metal deck tabs.

It is the generally accepted practice in the profession that shop drawings for suspended cement plaster ceilings are not prepared for approval. The exception to this general rule would be when a special ceiling configuration occurs which requires an unusual furring system.

What is the usual practice and what was done for the JSTC Project, was to submit as a shop drawing a list of materials indicating the size and weight of the furring and runner channels, the lath, and the manufacturer's stock numbers for the metal trim pieces which are required to complete the construction of the ceiling.

Shop drawing review and approval is one of the principal methods of coordination during the construction of a project.

On this project the PANYNJ Rail Construction Division was the Construction Manager, utilizing the services of a Construction Coordination Consultant. The

Construction Manager usually decides how to "package" the construction. That is, he splits the construction into different packages each of which will have a different contractor and contract. He decides what drawings and specifications are necessary to be included in each contract so a contractor can properly perform his work and coordinate it with the work of other contractors. The Architect, and his consulting engineers, prepare these drawings and specifications.

At JSTC, there was a Steel Contract which included the supplying and installing of the metal deck with the tabs. There was also a General Construction Contract which included the pouring of concrete on top of the metal deck and the installation of the cement plaster ceiling under the metal deck.

The restriction of using the deck tabs for a maximum load of 60 pounds is contained in the specification and on the shop drawings for the steel contract. The specification for the cement plaster ceiling is contained in the General Construction Contract.

In our opinion, it is likely that the load restriction was not properly coordinated between these contracts and, therefore, there was no documentation as to how the spacing of the hangers would be affected by the capacity of the tabs. Without this documentation, and with the sub-contractor installing the ceiling utilizing the customary spacing of the hangers in a 4-foot grid referred to in the specification, the field inspectors did not have a documented reference to find fault with the a 4-ft. grid of hangers.

The investigation is still continuing in the areas of roles and responsibilities. There is not sufficient information at the time of this Interim Report to more specifically identify how this coordination deficiency may have occurred.

VII. REVIEW OF LITERATURE AND CODES

A. APPLICABILITY ON THIS PROJECT FOR THIS TYPE OF CONSTRUCTION

The use of a suspended cement plaster ceiling provides an excellent finish for the following reasons:

1. Provides a weather-resistant membrane.
2. Conceals the structural elements and pipes.
3. Aesthetically compatible with the pre-cast concrete panels.

Its use at JSTC was appropriate.

B. COMPLIANCE WITH CODES FOR THIS TYPE OF CONSTRUCTION

The Port Authority of New York and New Jersey as a bi-state agency is not required by law to follow the building code of the municipality in which a facility is constructed. However, it is PANYNJ's policy to follow the requirements of the local building code.

In discussions with personnel of the Jersey City Building Department, they have stated that Jersey City has, since approximately 1968, used the Building Officials Conference Code, which is commonly known as the BOCA Code.

We have reviewed the 1965 Code and the subsequent editions issued in 1970 and 1975 to ascertain the requirements for the loading aspects of the ceiling and the requirements for construction in relation to the contract documents.

LOADING

The BOCA Code Editions of 1965 and 1970 do not address the necessity of designing accessible ceiling space to support a concentrated load. In the 1975 BOCA Code, Section 707.0 Concentrated loads, Table 707 indicates that "scuttles, skylight ribs and accessible ceilings" shall be designed to sustain a load of 200 lbs.

The above loading requirement did not apply to JSTC as Building Codes are not retroactively applied.

This does not mean, however, that a properly designed and constructed suspended cement plaster ceiling, in conformance with the 1970 Code, cannot support this load. In our opinion, it can. The code reference standards specifically prescribes the size and spacing of all components of the ceiling, resulting in a design which can take both dead and live load as well as concentrated loads.

The code reference standards also state that inserts and anchors in a concrete slab should have the same strength as the wire hangers. The construction of the ceiling at JSTC did not meet this requirement of the code reference standard. The tab strength was approximately 500 lbs. compared to the hanger strength of approximately 1400 lbs., based on LPI tests.

CEILING COMPONENTS

The 1965, 1970 and 1975 BOCA Codes are virtually identical in their requirements. Section 821.0, Exterior Lathing and Stucco, indicates that "all exterior lathing, plastering and stucco work shall be installed of Portland Cement..." and shall conform to the standards listed in Appendices B and C.

In Appendix B, of the BOCA Code under Interior Finishes, the following references are noted:

> Portland Cement Plastering - Specifications for...
> ASA. 42.3 - 1946.
>
> Portland Cement Stucco - Specifications for ...
> ASA. 42.2 - 1946.

The above specifications have been revised and re-issued by the American National Standards Institute as A 42.2 - 1971 and are referred to in the 1975 BOCA Code. The revision, in our opinion, contains no change in substance in the definition of ceiling components.

The 1971 Edition contains specific references to the installation of expansion joints. This is being reviewed as part of the continuing investigation.

The material as specifed is in conformance with the code with one minor exception. The JSTC specified and installed main runner channels weighed 0.85 lbs. per lineal foot instead of the 1.12 lbs. per lineal foot indicated in the code. In our opinion this difference in weight is of no signifiance. (It should be noted that the 0.85 lbs./lineal foot is in conformance with the 1968 NYC Building Code).

In addition, there were other minor variances from the code requirements and the specifications in the constructed ceiling. Slightly smaller diameter wire, 9 gage, was sometimes used. In some cases the hanger spacing was slightly larger than the 4-foot x 4-foot grid required with the #8 wire. None of these minor variations, in our opinion, had anything to do with the failure.

VIII. CONCLUSIONS

A. INITIATING CAUSE OF FAILURE

The load in the hangers that supported the suspended cement plaster ceiling in relation to the capacity of the metal deck tabs created a load condition on the metal deck tabs beyond their designated design capacity.

Tests for the load carrying capacity of the tabs indicate a range from 380 to 560 lbs., which represents the load at which they will fail.

The Architect's specification and the metal deck manufacturer's shop drawings approved by the Architect, indicated a maximum allowable load of 60 lbs. per tab. The difference between the tested capacity and the allowable load represents a factor of safety in the range of 6 to 9 times. The ceiling as installed imposed a load on the hangers of approximately 200 lbs. This load represents a 250% overload condition relative to the maximum load of 60 lbs. for the metal deck tabs to which the hangers are attached.

The actual start of tab failures began prior to August 8, 1983, possibly more than a year before. In our opinion, this probably occurred, most probably, when mechanics entered the ceiling to conduct maintenance within the ceiling. Their weight increased the loads on some tabs into the failure range.

Analysis indicates tensile forces greater than 500 lbs. in hangers, due to load transfers from 24 tabs which had been broken prior to August 8, 1983. The highest tensile force in the hangers occurred at the location of the access hatch.

When a mechanic entered the ceiling on August 8, 1983, his additional weight caused a highly loaded tab to fail. This additional load was distributed to the other tabs, which were also highly loaded, and started a sequential failure of the tabs, thus causing the total collapse.

B. REASON FOR TOTAL COLLAPSE

The entire 10,500 square feet of ceiling surrounding the entrance well to the PATH trains collapsed because the supporting grillage of channels and hangers were of continuous construction. That is, there were no expansion joints in the ceiling suspension system. Control Joints were provided in the ceiling finish.

The industry practice concerning expansion joints in suspended cement plaster ceilings is not clear and is still under investigation.

It should also be noted, however, that the reason for expansion joints is to accommodate shrinkage and temperature effects, not to minimize collapses. At this time, no conclusion is drawn from the absence of full expansion joints.

C. DEFICIENCIES DURING THE DESIGN AND CONSTRUCTION OF THE JSTC

The deficiency which caused the overload of the tabs was one of coordination during the shop drawing stage. The coordination required to implement the 60 pound load restriction on the tabs was not implemented. The roles and responsibilities in this area are still under investigation.

D. OTHER CONCLUSIONS

1. Without documentation as to how the spacing of the hangers would be affected by the capacity of the tabs, it is not reasonable to expect field inspectors to find fault with a 4-ft. grid of hangers.

2. Visual inspections indicated corrosion of the tabs. Most of this was surface corrosion which did not significantly reduce the strength of the tabs. Corrosion was not a significant factor in the fracture of the tabs. Even if no corrosion was present, it is our opinion that the tab failures would have still occurred.

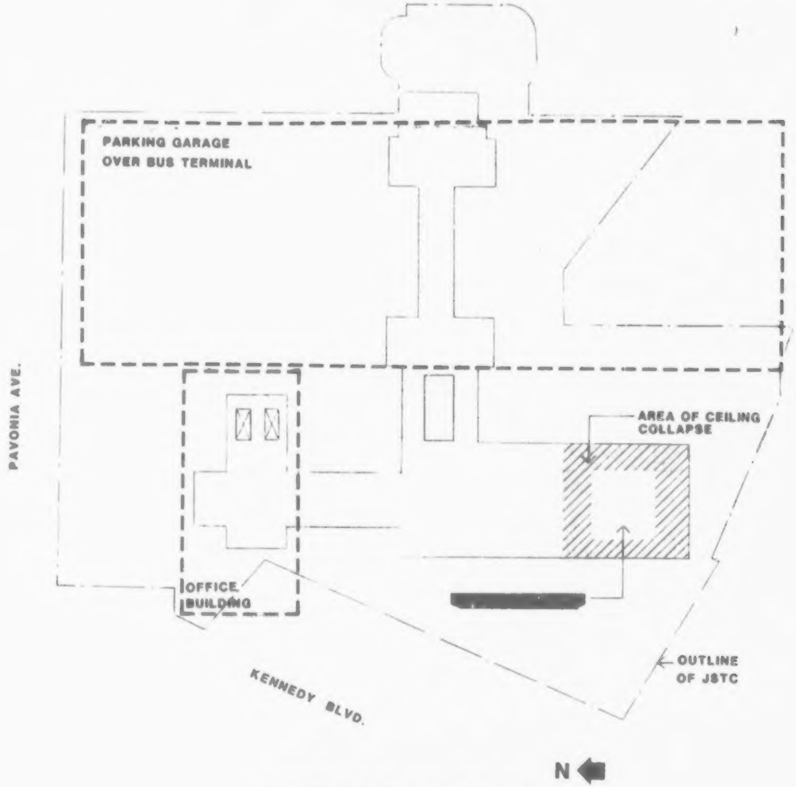
3. The cement plaster ceiling at JSTC represents an acceptable industry practice for the design and construction of suspended cement plaster ceilings. It is not clear, however, whether suspending the ceiling from metal deck tabs was acceptable practice and this area of the investigation is continuing.

4. There was no restriction in the applicable building code, at the time of the project, nor is there now, which prohibits the suspending of a cement plaster ceiling from metal deck tabs. The BOCA (Building Officials Conference of America) Code is the applicable building code for the project. One specific strength requirement in a reference standard of the code was not adhered to, that is, that the connection at the slab be as strong as the wire hanger.

5. Maintenance men walking within a cement plaster ceiling is a customary practice. By itself, this practice is not a contributing factor to the collapse; that is, their weight in a ceiling with adequate strength would not cause any overload problem.

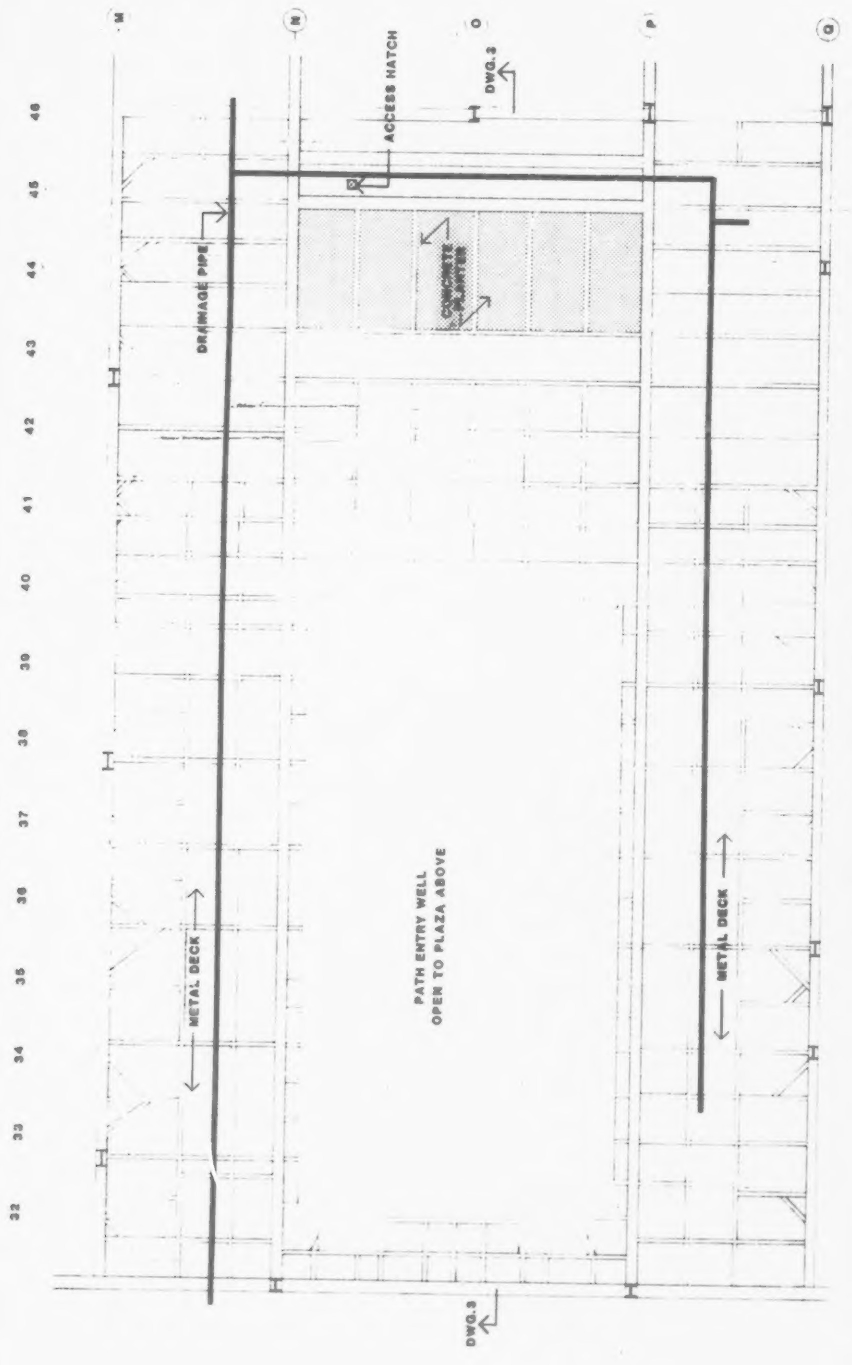
APPENDIX A

DRAWINGS


PARKING GARAGE
OVER BUS TERMINAL
PAVONIA AVE.
OFFICE BUILDING
AREA OF CEILING COLLAPSE
OUTLINE OF JSTC
KENNEDY BLVD.
N

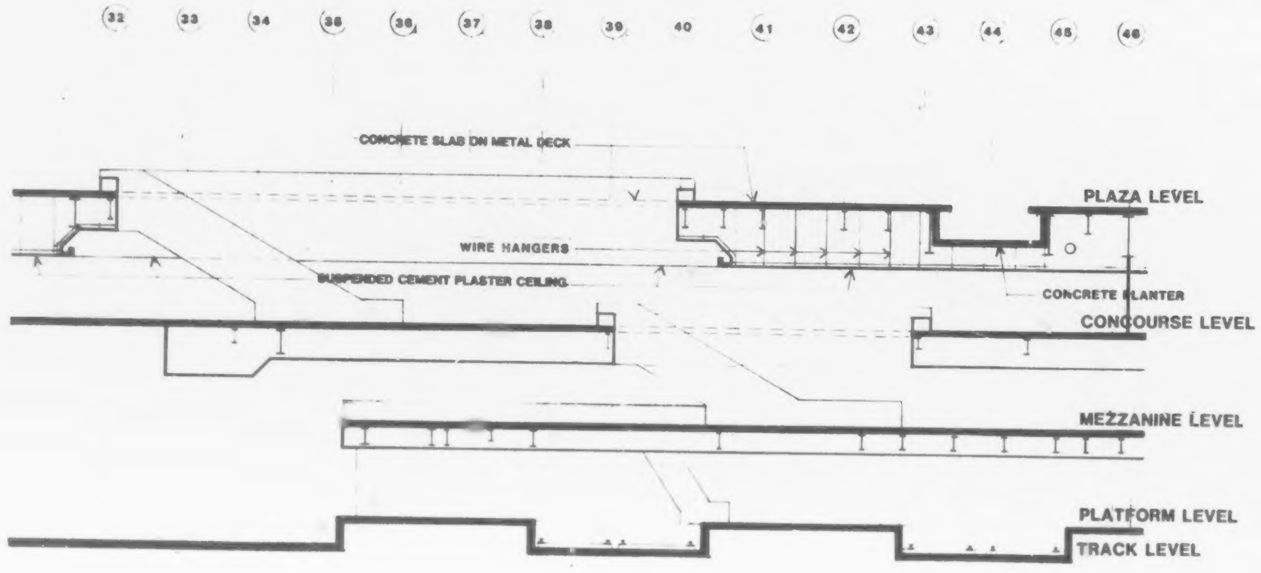
SCHEMATIC CONCOURSE PLAN

DWG. 1


M
N
O
P
Q
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
DRAINAGE PIPE
ACCESS HATCH
DWG.3
CONCRETE PLANTER
METAL DECK
PATH ENTRY WELL
OPEN TO PLAZA ABOVE
METAL DECK
DWG.3
N

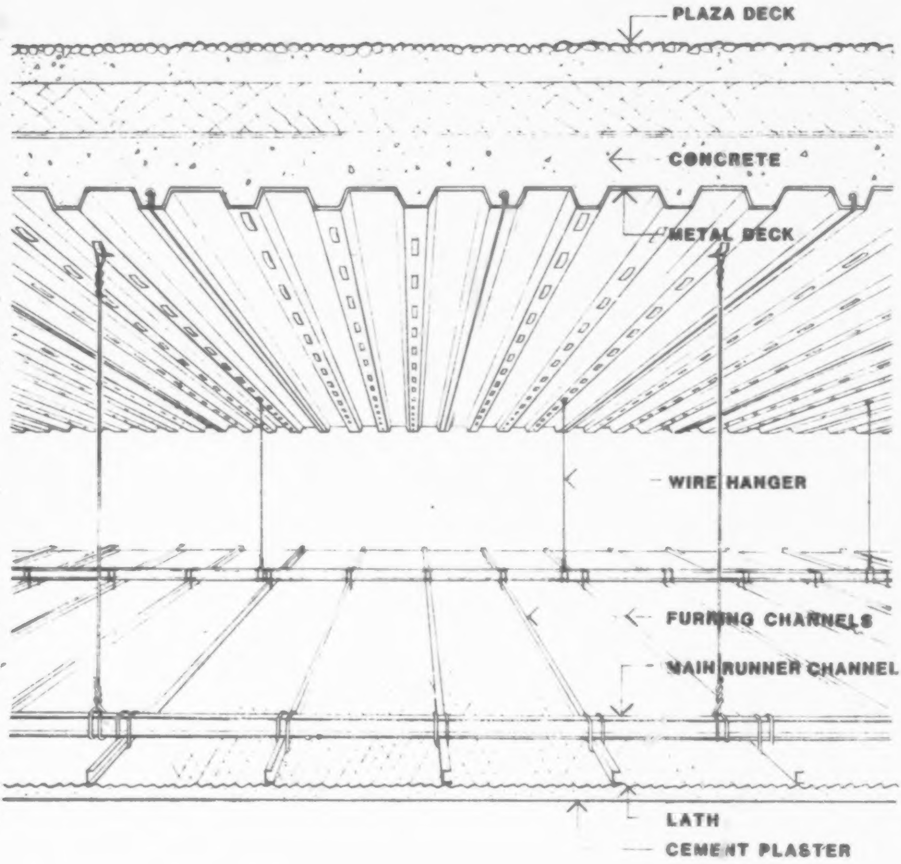
REFLECTED FRAMING PLAN OF PLAZA FLOOR CONSTRUCTION

DWG. 2


32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
CONCRETE SLAB ON METAL DECK
WIRE HANGERS
SUSPENDED CEMENT PLASTER CEILING
PLAZA LEVEL
CONCRETE PLANTER
CONCOURSE LEVEL
MEZZANINE LEVEL
PLATFORM LEVEL
TRACK LEVEL

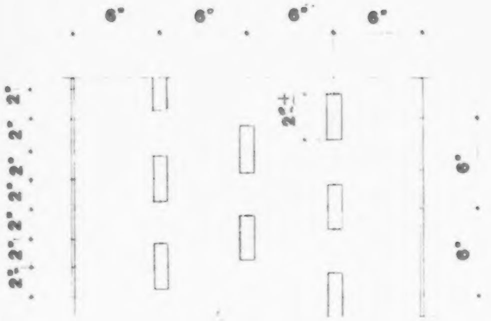
SECTION THRU JSTC - PATH ENTRY WELL

DWG. 3

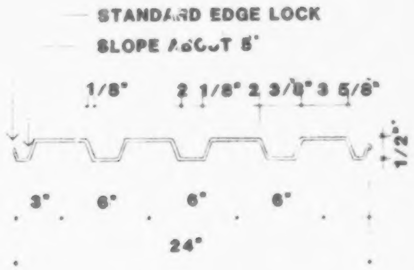

PLAZA DECK
CONCRETE
METAL DECK
WIRE HANGER
FURRING CHANNELS
MAIN RUNNER CHANNEL
LATH
CEMENT PLASTER

SECTIONAL VIEW–SCHEMATIC
FLOOR CONSTRUCTION & HUNG PLASTER CEILING

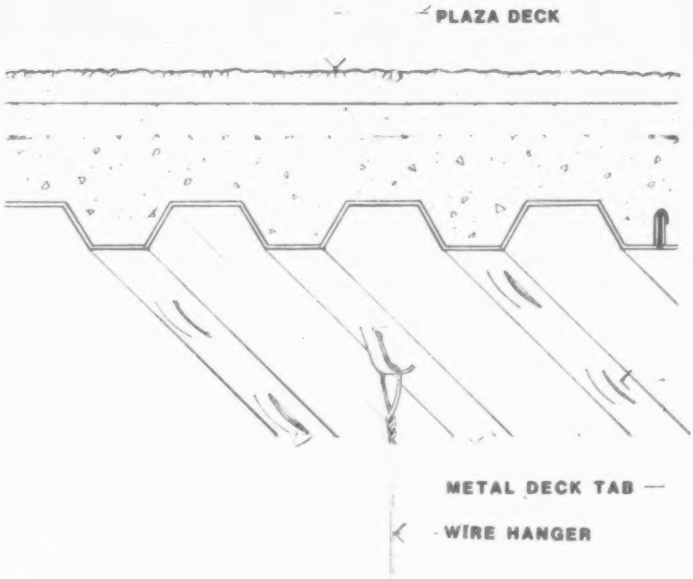
DWG. 4


6"
6"
6"
6"
2" 2" 2" 2" 2" 2" 2" 2"
2"±
6"
6"

PLAN


STANDARD EDGE LOCK
SLOPE ABOUT 5°
1/8"
2 1/8"
2 3/8"
3 5/8"
1/2"
3"
6"
6"
6"
24"

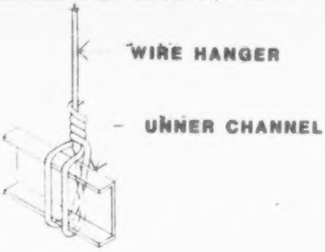
SECTION


PLAZA DECK
METAL DECK TAB
WIRE HANGER

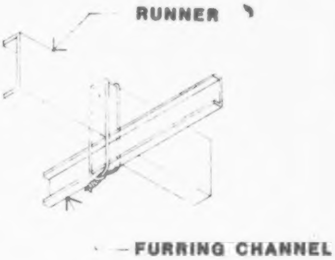
VIEW OF METAL DECK TAB & WIRE HANGER

DWG. 5

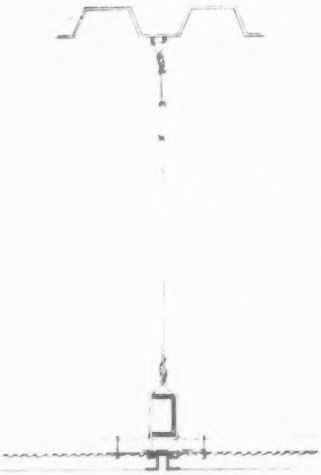
TYPICAL SCHEMATIC REPRESENTATION OF CEILING DETAILS


WIRE HANGER
UNNER CHANNEL

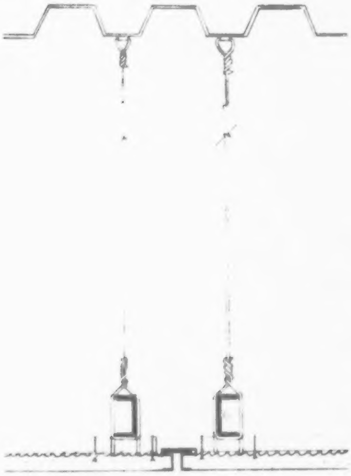
RUNNER CHANNEL TIE


RUNNER
FURRING CHANNEL

FURRING CHANNEL TIE



JOINT THRU PLASTER
& LATH



JOINT THRU SUPPORTING
GRILLAGE

DWG. 6

APPENDIX B

LUCIUS PITKIN INC. REPORT

Lucius Pitkin
INCORPORATED

Metallurgical and Chemical Consultants
Testing Laboratories–Nondestructive Examination Services

50 HUDSON STREET, NEW YORK, N.Y. 10013 (212) 233-2737
TELEX 12-6615 CABLE NIKTIP (212) 233-2558

September 26, 1983

Our Ref.: T.R. 7266

Lev Zetlin Associates, Inc.
95 Madison Avenue
New York, N.Y. 10016

Attention: Mr. R. Tomasetti, P.E.

Subject: CONCOURSE LEVEL SUSPENDED CEILING COLLAPSE
PATH JOURNAL SQUARE STATION, JERSEY CITY, NEW JERSEY
(Your Ref.: Project No. 3280)

Gentlemen:

We are forwarding to you under separate cover, our report (T.R. 7266) with regard to our investigation of the Concourse Level Suspended Ceiling Collapse at the Path Journal Square Station, Jersey City, New Jersey.

The report has been prepared as Appendix B to Lev Zetlin Associates, Inc. Interim Report, Project No. 3280.

Should you have any questions regarding our report, please do not hesitate to contact me.

Very truly yours,

LUCIUS PITKIN, INC.

A. J. Vecchio, P.E.
Vice President &
Asst. Chief Metallurgist

AJV/mm

Lucius Pitkin
INCORPORATED

Metallurgical and Chemical Consultants
Testing Laboratories–Nondestructive Examination Services

50 HUDSON STREET, NEW YORK, N.Y. 10013 · (212) 233-2737
TELEX 12-6615 · CABLE NIKTIP · (212) 233-2558

TECHNICAL REPORT NO. 7276

CONCOURSE LEVEL SUSPENDED CEILING COLLAPSE
PATH JOURNAL SQUARE STATION
JERSEY CITY, NEW JERSEY

SUBMITTED AS APPENDIX B

TO

LEV ZETLIN ASSOCIATES, INC.
INTERIM REPORT PROJECT NO. 3280

Lucius Pitkin
INCORPORATED
EST. 1885
Metallurgical and Chemical Consultants
Testing Laboratories-Nondestructive Examination Services
50 HUDSON STREET, NEW YORK, N.Y. 10013 · (212) 233-2737
TELEX 12-6615 · CABLE NIKTIP (212) 233-2558

TABLE OF CONTENTS

Page No.

INTRODUCTION 1

PROCEDURES AND OBSERVATIONS

A. Visual Examination 2
B. Tab Thickness Measurements 3

C. In-Situ Load Tests

1. Metal Deck Tabs 4
2. Embedded Concrete Studs 4

D. Hanger Wires

1. Tensile Tests 4
2. Composition 5
3. Microstructure 5

E. Deck Tabs

1. Fractographic Examination 5
2. Metallographic Examination 6
F. Ceiling Weight Determination 6

DISCUSSION AND CONCLUSIONS 7

APPENDIX

Table I - Fractured Tab Thickness 9
Table II - In-Situ Deck Tab Load Test . . 13
Table III - In-Situ Embedded Concrete Stud Clip Assembly Load Tests . . . 14
Table IV - Hanger Wire Load Tests 15
Table V - Hanger Wire Composition 16

Fig. 1 - Schematic Reflected Deck Plan at Plaza Framing Level 17
Fig. 2 - Concourse Level South End . . . 18
Fig. 3 - Plaza Level Metal Deck - Near South Wall 19
Fig. 4 - Plaza Ceiling Metal Deck - Near South Wall 20
Fig. 5 - Plaza Ceiling Metal Deck - Near South Wall 21
Fig. 6 - Plaza Ceiling Metal Deck - North End 22
Fig. 7 - Fractured Deck Tabs - Bay 10 . 23
Fig. 8 - Rusted Metal Deck Tabs 24
Fig. 9 - Plaza Ceiling 25
Fig. 10 - "New" Fractured Metal Deck Tab. 26
Fig. 11 - "Old" Fractured Metal Deck Tab. 27

TABLE OF CONTENTS (Continued)

		Page No.
Fig. 12	- Twisted Tab	28
Fig. 13	- Fractured 0.147 In. Diameter Hanger Wire	29
Fig. 14	- Hanger Wire - Location 10E14 .	30
Fig. 15	- "Old" Fractured Deck Tab . . .	31
Fig. 16	- "Old" Fractured Deck Tab . . .	32
Fig. 17	- "New" Fractured Deck Tab . . .	33
Fig. 18	- "New" Fractured Deck Tab . . .	34
Fig. 19	- "Old" Fractured Tab 10D1 . . .	35
Fig. 20	- "New" Fractured Tab 10D2 . . .	36
Fig. 21	- Tab Microstructure	37
Fig. 22	- Zinc Galvanize Coating	38
Fig 23	- Suspended Ceiling	39

Lucius Pitkin
INCORPORATED
Metallurgical and Chemical Consultants
Testing Laboratories-Nondestructive Examination Services
50 HUDSON STREET, NEW YORK, N.Y. 10013 (212) 233-2737
TELEX 12-6615 · CABLE NIKTIP (212) 233-2658

September 26, 1983

T.R. No. 7276

L.P. M-7337

Your P.O. - Verbal

Lev Zetlin Associates, Inc.
95 Madison Avenue
New York, N.Y. 10016

Attention: Mr. R. Tomasetti, P.E.

Subject: CONCOURSE LEVEL SUSPENDED CEILING COLLAPSE
PATH JOURNAL SQUARE STATION, JERSEY CITY, NEW JERSEY

INTRODUCTION:

This report covers an investigation of the collapse of the Concourse Level suspended ceiling at the Path Journal Square Station, Jersey City, New Jersey by Lucius Pitkin, Inc.

We were advised that the ceiling collapse occurred at approximately 9:00 AM on August 8, 1983 during start of repair of the ceiling. The ceiling was suspended approximately 8-1/2 feet below the Plaza level floor. Entry to the suspended ceiling for the repair had been through an access hatch cut into the ceiling near the south wall of the Concourse.

Investigation of the ceiling collapse entailed photographic and location documentation of fractured metal deck tabs and hanger wires by which the ceiling was suspended. In addition, load testing was performed on metal deck tabs, embedded concrete studs, and hanger wires. Fractographic and metallographic examinations were performed to ascertain the nature and, if possible, the probable cause of metal deck tab and hanger wire fractures.

PROCEDURES AND OBSERVATIONS:

A. Visual Examination

In order to identify and locate fractured deck tabs, remaining hanger wires and concrete embedded studs, a "reflected" plan view of the metal deck above the south end of the Concourse Level was prepared and is shown in Fig. 1. (It was not considered necessary to make a plan of the balance of the ceiling in that the remaining fractured metal tabs were similar and all appeared to be recent fractures.)

A thorough visual examination of the fractured deck tabs in the south central area of the collapse revealed approximately 24 deck tabs to exhibit rusted fracture surfaces indicating these tabs to have failed prior to the collapse of the ceiling on August 8, 1983.

The remaining fractured tabs, which occurred at approximately every four feet, in the south central area and elsewhere, except for several along the east and west walls which were found to have been previously twisted, exhibited relatively bright, shear-type fracture at mid-length indicating these tabs to have fractured at the time of the ceiling collapse.

Tabs which had been mechanically twisted were found in bays 2, 9, 12, 13 and 14 along the east wall and bays 7, 11, 23 and 25 along the west wall. These twisted tabs were generally heavily rusted and in some cases had fractured at one end of the tab rather than at mid-length of the tab as was the case in the other "old" and recent fractured tabs examined.

Each of the fractured and load tested deck tabs were located and identified by bay number, row letter and column number. The location of remaining embedded concrete studs were also located on the deck plan. In addition, the ground level planter and suspended drain pipes are also shown in the deck plan.

Figs. 2 through 9 are photographs showing the deck ceiling and broken tabs as viewed on August 9, 1983.

Figs. 10 and 11 are close-up photographs showing a recent fractured tab and an old fractured tab respectively. Fig. 12 is a photograph showing a previously twisted and rusted deck tab from the south-east corner.

Of particular importance is that in examining the fractured deck tabs, it was noted that both recent and old fractured tabs were immediately adjacent to each other on the north side of the drain pipe in the vicinity of what was reported to be the access opening that had been cut in the ceiling. The location of this access opening is shown in Fig. 1.

It was also observed that, in general, the deck tabs in the vicinity of the Concourse south wall appeared to be slightly more corroded and the zinc galvanize coating was consumed to a greater degree as compared to the deck tabs on the north end of the Concourse.

Several hanger wires along the west wall, which were attached to electrical conduit, were found to exhibit ductile cup-cone fractures characteristic of overload failure. In addition, several wires in the north east end of the Plaza remained attached to deck tabs. These wires exhibited bright, opposing chisel-shaped fractures as would occur from a recent (most probably during removal of the collapsed ceiling) wire cutting and were several inches shorter than a full-length hanger wire.

One 0.147 in. diameter fractured hanger wire was found still attached to a deck tab at location 10E14 adjacent to the access opening. This wire exhibited a bright, clean torsional shear fracture free of necking down but showing a twist in the wire surface immediately adjacent to the fracture. It was deduced that this fracture occurred in a wire that had been looped approximately 37 inches from the tab, or at approximately mid-length with respect to the ceiling height. This wire is shown in Figs. 13 and 14.

Examination of the concrete holes from which the studs had pulled out, revealed a circular area of concrete around each hole to be broken away from the ceiling. In general, the stud holes were vertical and 1-in. to 1-1/4 in. deep.

Examination of the remaining embedded 90-degree 3/4 in wide x 0.070 in. thick steel stud clips indicated they had failed by tearing through a 1/4-in. diameter hole through which the hanger wire had been threaded and wrapped.

B. Tab Thickness Measurements

In order to evaluate the extent to which corrosion had decreased the thickness of the deck tabs and thus their load-carrying capacity, thickness was measured of approximately 100 fractured tabs at various locations over the entire collapsed section of the ceiling. The deck tabs, which nominally measured 0.35 in. wide x 2 in. long, exhibited a thickness of 0.027 in. to 0.032 in. depending on the extent of corrosion. The corroded tabs were near the south Concourse wall; the clean, uncorroded tabs, near the north wall. Fractured tab thickness measurements are shown in Table I appended.

C. In-Situ Load Tests

1. Metal Deck Tabs

In-situ load tests were performed on numerous intact metal deck tabs and several of the embedded concrete stud clips. Load tests of the metal deck tabs and embedded concrete stud clips were performed using a 0.161 in. diameter hanger wire from the suspended ceiling wrapped in a similar manner as the observed ceiling hanger wires and a calibrated load system.

Load tested metal deck tabs broke at loads of from 380 to 560 lbs. Results of the load tests are given in Table II appended.

Evaluation of the fracture test loads with respect to the corroded deck tab thickness did not reveal any significant correlation.

2. Embedded Concrete Studs

The remaining embedded concrete stud clips exhibited a torn-hole through the vertical side of the clip. In order to test the remaining embedded concrete stud clip assemblies, a 1/4-in. diameter hole was drilled through the vertical side of the clip. A 0.161 in diameter hanger wire was threaded through the 1/4-in. diameter hole to facilitate testing.

In-situ load tests of the embedded concrete stud clips showed the assemblies to be capable of carrying loads higher than 950 lbs. - well above the maximum fracture test load of the deck tabs.

Complete results of the concrete stud clip load tests are given in Table III appended.

D. Hanger Wires

1. Tensile Tests

Tensile tests were performed on several specimens of hanger wire. The wires broke at average ultimate tensile loads of 1180 and 1450 lbs for the 0.147 in. diameter and 0.160 in. diameter wires, respectively.

In an attempt to duplicate the fracture appearance of the broken wire tied to the unbroken tab at location 10E14, adjacent to the access opening, specimens of the same size (0.147 in. dia.) wire were tensile tested after looping the wire at mid-length. Results of these tensile test performed on the looped wires showed the wires to exhibit significantly lower ultimate loads ranging from 420 to 480 lbs with a similar torsional shear-type fracture rather than a ductile, cup-cone fracture normally as produced by un-looped uniaxial tensile tests of hanger wires.

Complete results of the hanger wires tensile tests are given in Table IV appended.

2. Composition

Qualitative spectrographic analysis of 0.147 in. and 0.161 in. diameter hanger wire samples removed from the collapsed ceiling showed both wires to be similar in composition and to be plain, carbon steels. Complete results of the analysis performed are shown in Table V appended.

3. Microstructure

Longitudinal and transverse specimens were cut from the 0.147 in. and 0.161 in. diameter hanger wires and prepared for metallographic examination.

In the as-polished, unetched condition, the specimens of both wire diameters exhibited a normal quantity of non-metallic inclusions and the wire material was considered satisfactory in this respect. It was further observed that both wire diameters contained a uniform zinc coating which measured 0.001 in. thick.

Etching the specimens revealed the general microstructure of both wire diameters to be similar and to consist of more-or-less equiaxed ferrite grains with a small amount of pearlite typical of an annealed plain, low-carbon steel. Carbon content, based upon amount of pearlite present, was estimated at 0.10 percent.

E. Deck Tabs

1. Fractographic Examination

Binocular examination of the fractured tabs removed from the deck confirmed the nature of all the fractures examined, except for the mechanically twisted tabs, to be shear-type fractures attributed to overload with respect to the tab cross-section. The rust-covered fractures of deck tabs which were considered "old" fractures, are shown in close-up photographs, Figs. 15 and 16. The bright recent, or "new" fractures, which in our opinion, occurred on August 8, 1983 are shown in Figs. 17 and 18.

2. Metallographic Examination

Longitudinal specimens were cut from the fractured tabs so as to intersect the fracture surfaces. In addition, transverse specimens were taken through the tabs to determine the thickness of the zinc coating. These specimens were taken from both "old" and new" fractured tabs. The specimens were mounted in Bakelite plastic, ground and polished for metallographic examination.

Suitable etching revealed the general microstructure of the deck tab specimens which was found to consist of slightly elongated ferrite grains (the iron phase) with a small amount of spheroidized iron carbides, typical of a spheroidized annealed, low-carbon steel.

Examination of the fracture surfaces showed the microstructure adjacent to the fractures to exhibit severe grain distortion as would occur from shear overload. It was also observed that some insignificant localized pitting corrosion of the tab surface had occurred. The fracture surface exhibited by an "old" and "new" fractured tabs is shown in Figs. 19 and 20, respectively.

Distant from the fracture surface, in an area of the tab where the zinc galvanize coating was intact, the tab thickness, as shown in Fig. 21, was measured to be 0.032. The galvanize coating, where present, was continuous and uniform and measured 0.0003 in. thick as shown in Fig. 22.

F. Ceiling Weight Determination

A 24 in. x 24 in. section of the suspended ceiling removed from the mezzanine level which was of similar construction as the collapsed ceiling weighed and found to weigh 46.5 lbs., which calculates to 11.6 lbs per square foot. The section is shown in Fig. 23.

DISCUSSION AND CONCLUSIONS:

Metallurgical investigation of the Journal Square Station Concourse Level suspended ceiling collapse of August 8, 1983 performed by Lucius Pitkin, Inc. established, in our opinion, that initiation of the ceiling collapse was the result of localized overloading of deck tabs adjacent to the south wall of the Concourse which triggered a succession of metal deck tab and concrete stud clip failures.

Investigation revealed approximately 24 deck tabs in the south central section of the Plaza to exhibit rusted fracture surfaces indicating these tabs to have failed at some long time prior to collapse of the ceiling on August 8, 1983. It was further observed that there were recent, fresh (un-rusted) tab fractures found immediately (as compared to the normal 4-ft. wire spacing) adjacent to several of the rusted, pre-existing fractured deck tabs. This indicated that there had been a relocation of several hanger wires after initial installation of the ceiling and prior to the collapse.

Although corrosion attack of the metal deck tabs in the south central section of the Plaza had occurred, tab load tests, thickness measurements and metallurgical examination showed that the extent of corrosion was slight and could not have so reduced tab strength as to be a significant contributing factor in initiating collapse of the ceiling.

Examination of the fractured tabs indicated that the 24 fractured tabs exhibiting rusted fracture surfaces probably occurred some long time, possibly even more than a year prior to collapse of the ceiling. No significant difference could be determined between the "old" rusted fracture surfaces of the deck tabs on either side of the east-west drain pipe near the south wall. The twisted fractured tabs adjacent to the north-south drain pipes along the east and west walls also exhibited rusted fracture surfaces. However, these twist-fractured tabs suggest they were fractured by a different mechanism than the other shear overloaded fracture tabs, and, in our opinion, were most probably fractured during construction when they may have been used temporarily for purposes other than hanging wires.

The presence of a 0.147 in. diameter hanger wire (10E14) attached to an unfailed tab located immediately adjacent to the ceiling access opening which exhibited a torsional shear fracture, had to have failed at a lower load than the tab breaking load, apparently due to a loop in the hanger wire at approximately mid-length of the wire. It was demonstrated by test that a looped hanger wire will fracture at a load approximately one-third of the tensile strength of a straight hanger wire and close to the strength of the deck tabs. In addition, a partial loop was present approximately 5 inches below the twisted or metal deck tab end of the wire. Thus, it would appear, that this wire had been relocated prior to the collapse of the ceiling and a mid-length loop introduced at that time of relocation.

It was determined that tested embedded concrete stud clips were capable of carrying loads in excess of 950 lbs. In addition, both 0.147 (9 gage, W&M) and 0.161 in. (8 gage, W&M) diameter galvanized, low-carbon steel hanger wire was used to suspend the ceiling.

The suspended ceiling was a composite fabricated of channels, wire mesh, plaster and mortar weighed approximately 11.6 lbs. per square foot.

Respectfully submitted,

LUCIUS PITKIN, INC.

AJVecchio

A. J. Vecchio, P.E.
Vice President &
Asst. Chief Metallurgist

AJV/mm/4

TABLE I

FRACTURED TAB THICKNESS

Location	Thickness, in.	Location	Thickness, in.
1A1	0.030	4A3	0.028
1G1	0.031	4G3	0.028
1A4	0.030	4G10	0.029
1H4	0.030	4G14	0.030
1A12	0.030	4B18	0.030
1H12	0.031	4G20	0.031
2A1	0.030	5C4	0.029
2H1	0.030	5I6	0.028
2A3	0.027	5D12	0.029
2G3	0.031	5I14	0.028
2B7	0.029	5C18	0.030
2H7	0.030	5I18	0.029
2B9	0.029	6D3	0.029
2H9	0.030	6I3	0.029
2G12	0.031	6I10	0.031
2A13	0.030	6D11	0.029
2B13	0.030	6I18	0.031
2G16	0.030	6D20	0.031
2A19	0.028	7C3	0.031
3B2	0.029	7I3	0.030
3G2	0.029	7C11	0.031
3C10	0.030	7I11	0.032
3G10	0.028	7C16	0.029
3G17	0.028	7I16	0.030

TABLE I - Cont'd

FRACTURED TAB THICKNESS

Location	Thickness, in.	Location	Thickness,in.
7C18	0.029	10D10	0.029
7I18	0.027	10D16	0.031
7C19	0.032	10D24	0.028
7I19	0.030	10C25	0.029
8C2	0.028	10C29	0.029
8I2	0.029	10D29	0.030
8C8	0.030	10C34	0.029
8I8	0.030	10D34	0.030
8C14	0.031	10D42	0.030
8I14	0.030	10D50	0.028
8C16	0.030	10D58	0.028
8I16	0.031	10D66	0.028
8I20	0.030	10E74	0.031
9F1	0.031	10E86	0.029
9F4	0.028	12C1	0.031
9G20	0.030	12J1	0.029
9G21	0.030	12C4	0.030
9G26	0.030	12C12	0.030
9G28	0.030	12C20	0.031
9G30	0.029	12C22	0.029
9F35	0.031	12J22	0.030
10D1	0.029	12J23	0.029
10D2	0.027	12C26	0.029
10D9	0.029	12J26	0.031

TABLE I - Cont'd
FRACTURE TAB THICKNESS

Location	Thickness, in.	Location	Thickness,in.
12C28	0.030	21C10	0.032
12J28	0.028	21I10	0.032
12B31	0.031	21C15	0.032
12J31	0.031	21I15	0.015
12B35	0.031	21B18	0.031
12J36	0.029	21H18	0.031
13H1	0.031	21B25	0.030
13H8	0.030	21H25	0.029
13H15	0.030	21B29	0.032
13H22	0.031	21H29	0.031
13H26	0.030	21B37	0.029
13H28	0.030	21H37	0.031
13H30	0.032	21B41	0.030
13H36	0.031	22F1	0.031
14D1	0.030	22F9	0.028
14D8	0.032	22F15	0.028
14D16	0.030	22F18	0.032
14D22	0.029	22F25	0.028
14E26	0.029	22F30	0.031
14D28	0.028	23D1	0.030
14E31	0.030	23D9	0.030
14E36	0.032	23E15	0.029
21B1	0.028	23D18	0.032
21I2	0.032	23D25	0.028
21B5	0.031	23D30	0.030

TABLE I - Cont'd

FRACTURE TAB THICKNESS

Location	Thickness, in.	Location	Thickness,in.
24C2	0.029	25B30	0.029
24J4	0.032	25I30	0.030
24C8	0.032		
24J15	0.031		
24C16	0.032		
24C22	0.031		
24J22	0.030		
24C26	0.028		
24J26	0.031		
24B31	0.032		
24J31	0.029		
24B36	0.031		
24J36	0.031		
25B1	0.032		
25J1	0.030		
25B9	0.031		
25J9	0.030		
25B15	0.031		
25I15	0.031		
25B18	0.029		
25I18	0.030		
25B25	0.032		
25I25	0.029		

TABLE II
IN SITU

DECK TAB LOAD TEST

Tab No.	Ultimate Load, lbs	Thickness, in.
(1) 4B12	430	0.027
(2) 4A14	400	0.029
(3) 3B18	400	0.031
(4) 3B14	380	0.030
(5) 6B5	380	0.028
(6) 7E11	500	0.030
(7) 7I4	560	0.031
(8) 21E19	530	0.030
(9) 21E23	500	0.031
(10) West Wall	420	0.030
(11) West Wall	480	0.029
(12) NW Corner	490	0.028
(13) NW Corner	450	0.030
(14) East Wall	510	0.030
(15) East Wall	450	0.029
(16) East Wall	500	0.030
(17) East Wall	460	0.030
(18) 24D36	480	0.030
(19) 24C31	450	0.031
(20) 12E17	430	0.032
(21) 12G20	500	0.032
(22) NE Corner	510	0.032
(23) NE Corner	480	0.030
(24) NE Corner	430	0.030

TABLE III

IN-SITU

EMBEDDED CONCRETE STUD CLIP ASSEMBLY LOAD TESTS

Stud No.	Ultimate Load, lbs	Remarks
15-7	950	Broke through clip hole
20-7	1000	Stud pulled out of concrete
20-2	1300	Clip hole elongated and pull rod fractured

TABLE IV

HANGER WIRE LOAD TESTS

Wire dia., in.	0.147	0.147	0.147	0.147	0.147	0.161	0.161	0.161	0.161
Wire condition	Straight	Straight	Single loop	Single loop	Single loop	Straight	Straight	Straight	Single loop
Ultimate load, lbs.	1,185	1,175	480	450	420	1430	1,455	1460	475
Ultimate strength psi	69,700	65,400	28,200	26,500	24,700	71,500	72,800	73,000	23,800
Type of fracture	Cup-cone	Cup-cone	Shear	Shear	Shear	Cup-cone	Cup-cone	Cup-Cone	Shear

Lucius Pitkin
INCORPORATED
EST 1885
Metallurgical and Chemical Consultants
Testing Laboratories–Nondestructive Examination Services
50 HUDSON STREET, NEW YORK, N.Y. 10013 · (212) 233-2737
TELEX 12-6615 · CABLE NIKTIP (212) 233-2558

TABLE V

SPECTROGRAPHIC ESTIMATES

— 16 —

Report No. M-7377 T.R. 7276 Date September 26, 1983
The following is our analysis of 2 sample(s) of zinc galvanize hanger wire

	0.161 In. Dia. Wire	0.147 In. Dia. Wire
Iron	Major	Major
Manganese	0.X	0.X
Aluminum	0.0X low	0.0X low
Nickel	0.0X low	0.0X low
Chromium	0.0X low	0.0X low
Copper	0.00X high	0.00X high
Vanadium	0.00X low	0.00X low
Magnesium	0.000X	0.000X
Silicon	0.000X	0.000X

Other elements looked for, but not found:

titanium, zirconium, molybdenum, zinc, bismuth, lead
tin, antimonyy, beryllium, gallium, germanium,
phosphorous, boron, cobalt, columbium, tungstenn

LUCIUS PITKIN, INC.

NOTE: Major = above 5% estimated. Minor = 1.5% estimated. .X, .OX, .OOX, etc. = concentration of the elements estimated to the nearest decimal place – e.g. .OX = .01-.09% estimated. *= less than. NF = not found.
The numbers in parenthesis indicate the estimated relative concentration of the element among the various samples.
Detectability varies considerably among the elements and also depends upon the amount and nature of the sample, therefore, "Not Found" or NF means not detected in the particular sample by the technique employed.

FORM 104-7/81

(SEE INSERT BACK COVER)

Fig. 1 REFLECTED DECK PLAN AT PLAZA FRAMING LEVEL

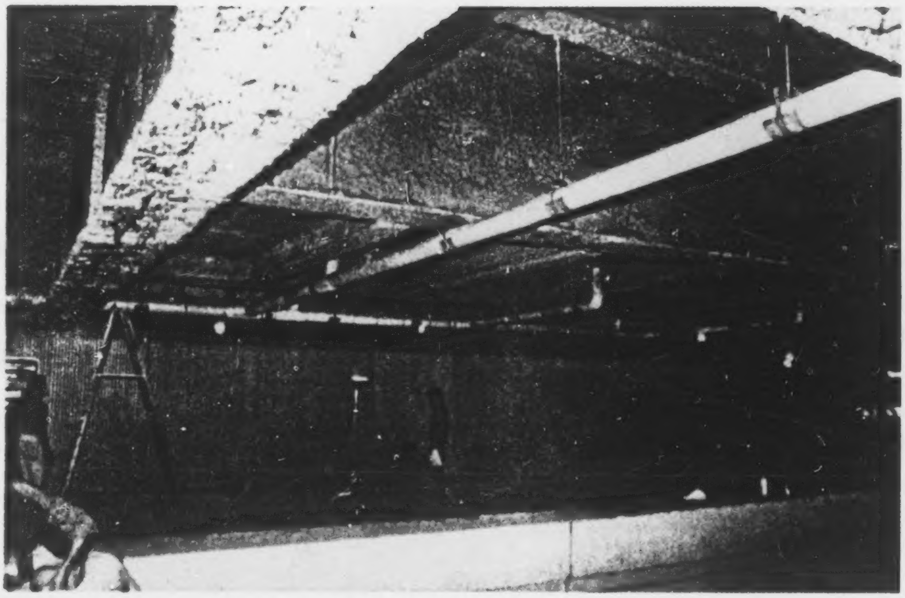


Fig. 2 CONCOURSE LEVEL SOUTH END

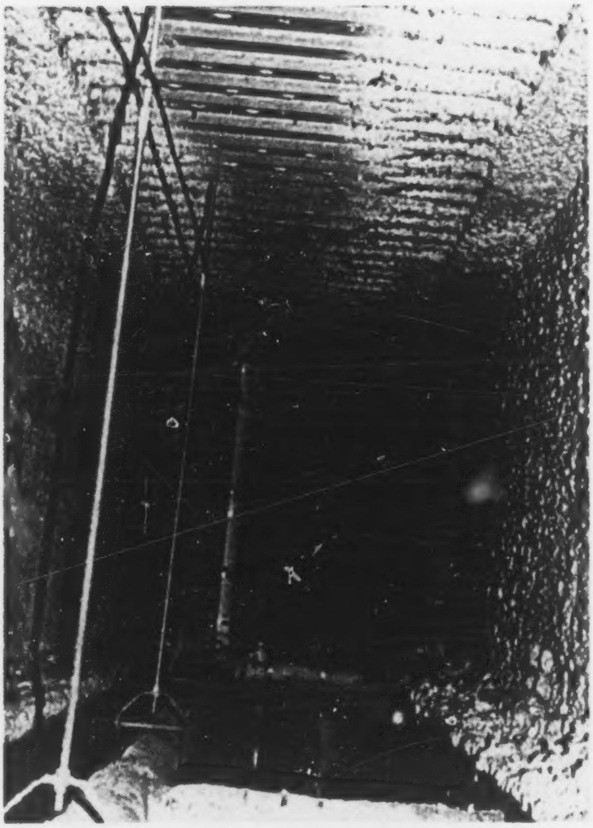


Fig. 3 PLAZA LEVEL METAL DECK - NEAR SOUTH WALL

The collapsed suspended ceiling had been joined to the metal deck tabs through hanger wires.

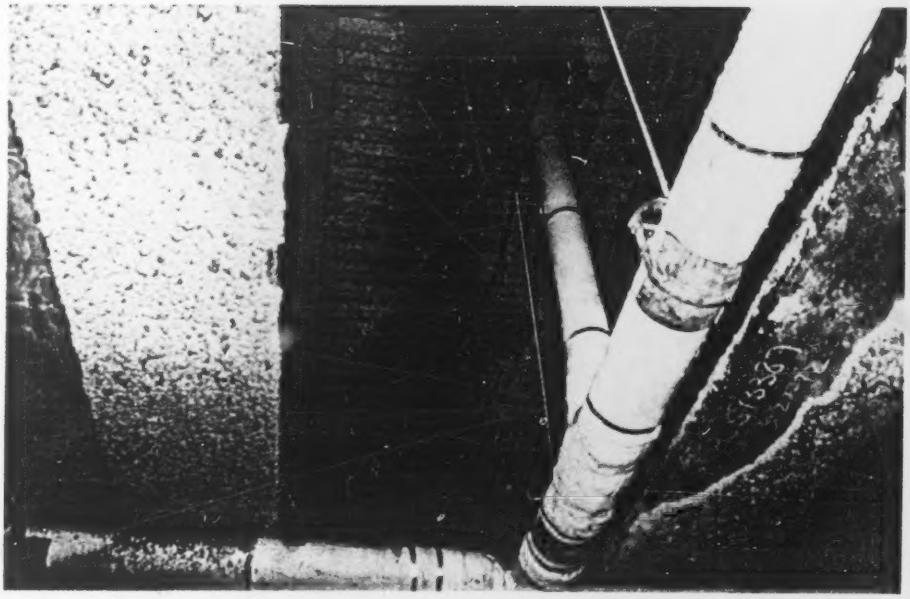


Fig. 4 PLAZA CEILING METAL DECK - NEAR SOUTH WALL

Numerous "old" fractured deck tabs were observed in the Plaza deck in the area of the drain pipe shown here.

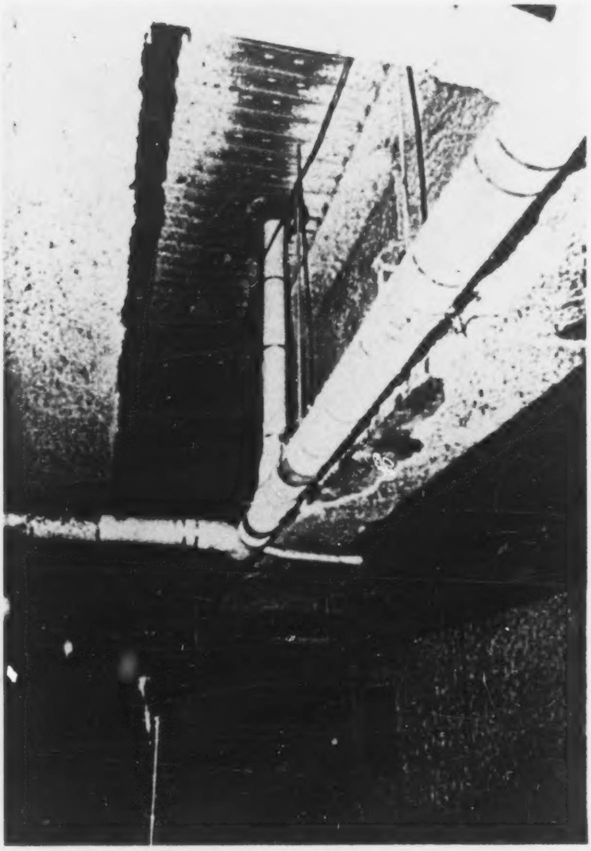


Fig. 5 PLAZA CEILING METAL DECK - NEAR SOUTH WALL

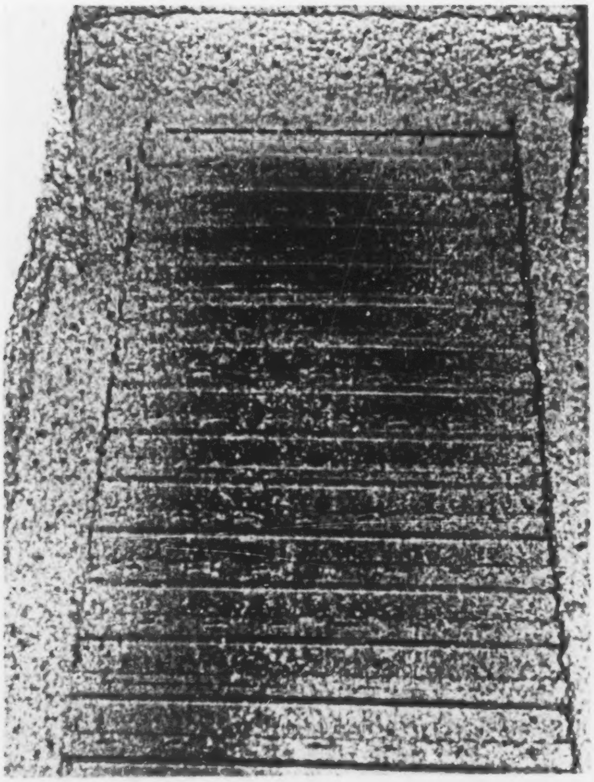


Fig. 6 PLAZA CEILING METAL DECK - NORTH END

Photograph showing the condition of the metal deck near the north end of the Concourse.

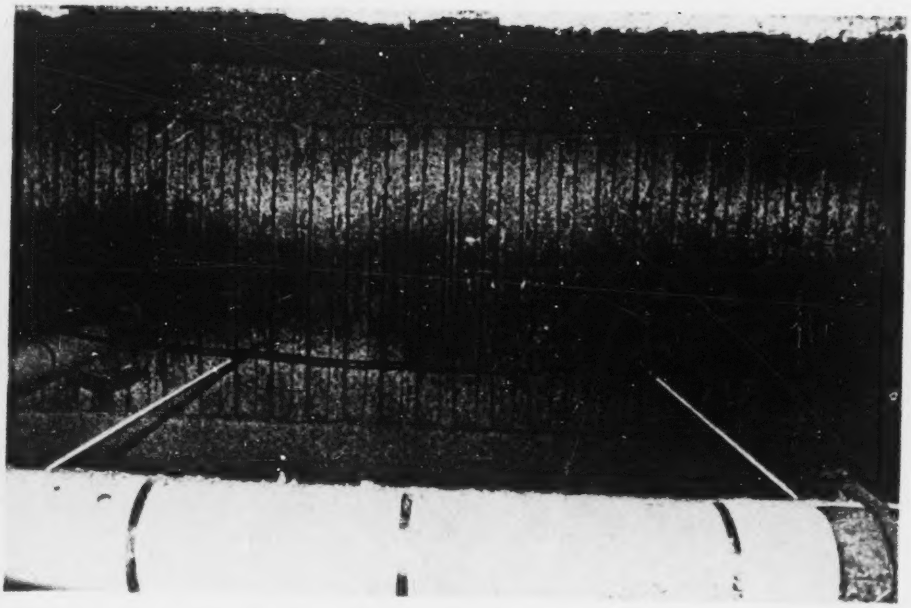


Fig. 7 FRACTURED DECK TABS - BAY 10

Photograph showing adjacent fractured deck tabs above east-west drain pipe near south wall.

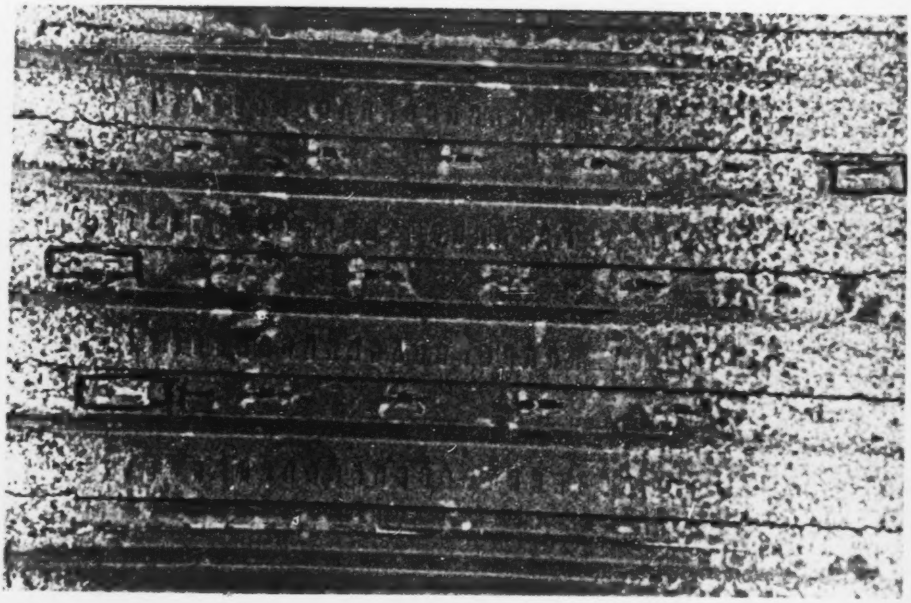


Fig. 8 RUSTED METAL DECK TABS

Photograph showing the rusted condition of the deck tabs adjacent to the south wall.

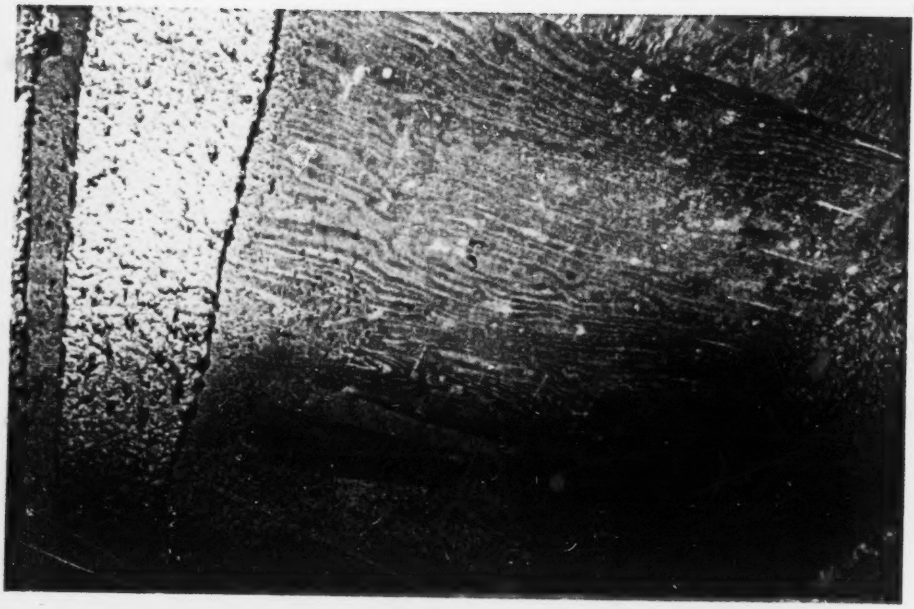


Fig. 9 PLAZA CEILING

Photograph showing the condition of the concrete Plaza ceiling where stud clip assemblies had been embedded in the ceiling from which hanger wires were tied.

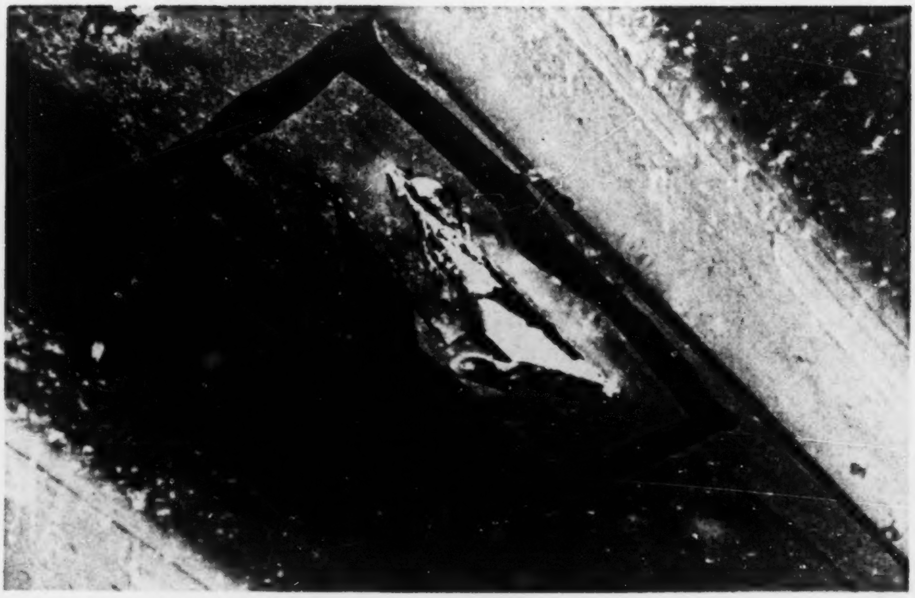


Fig. 10 "NEW" FRACTURED METAL DECK TAB

Photograph showing a typical "new" fractured metal deck tab. It can be seen that failure of the deck tab occurred at mid-length producing a shear-type fracture. The curvature of the normally flat tab near the fracture is the result of the wire hanger being tied to the tab.

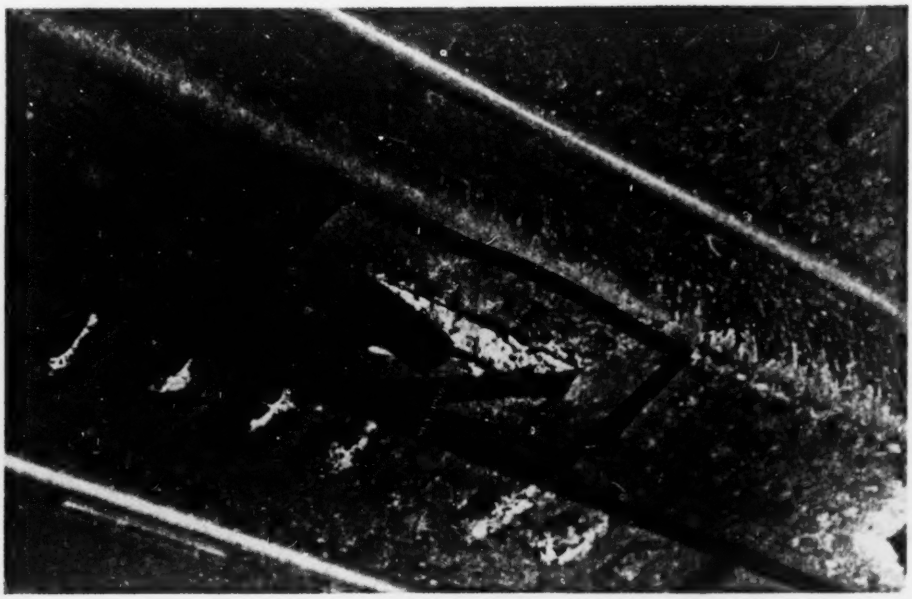


Fig. 11 "OLD" FRACTURED METAL DECK TAB

Close-up photograph showing "old" fractured metal deck tab. The surface of the tab is rusted and fracture occurred at mid-length, producing a shear type overload fracture.

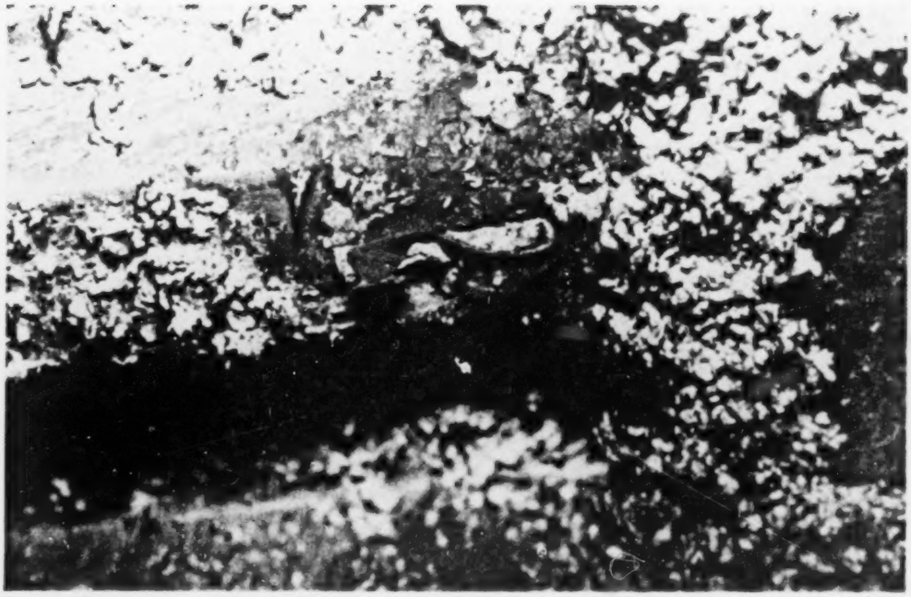


Fig. 12 TWISTED TAB

Photograph showing twisted and rusted deck tab which apparently had been twisted and fractured prior to collapse of the ceiling, most probably during construction of the station.

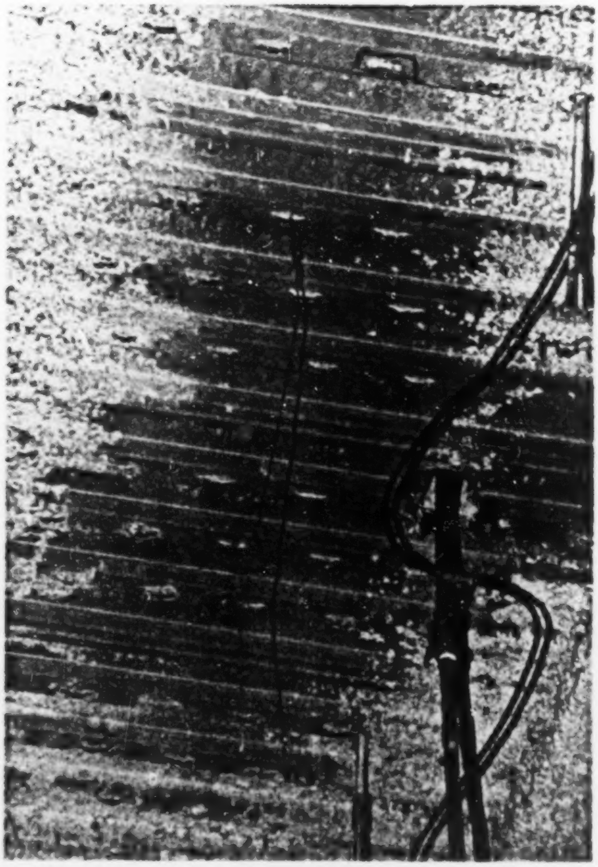


Fig. 13 FRACTURED 0.147 IN. DIAMETER HANGER WIRE

Photograph showing fractured 0.147 in. diameter wire still attached to metal deck tab. This wire was the only remaining hanger wire attached to a metal deck tab which exhibited a fracture. This wire was located immediately adjacent to the suspended ceiling access hole corresponding to location 10E14.

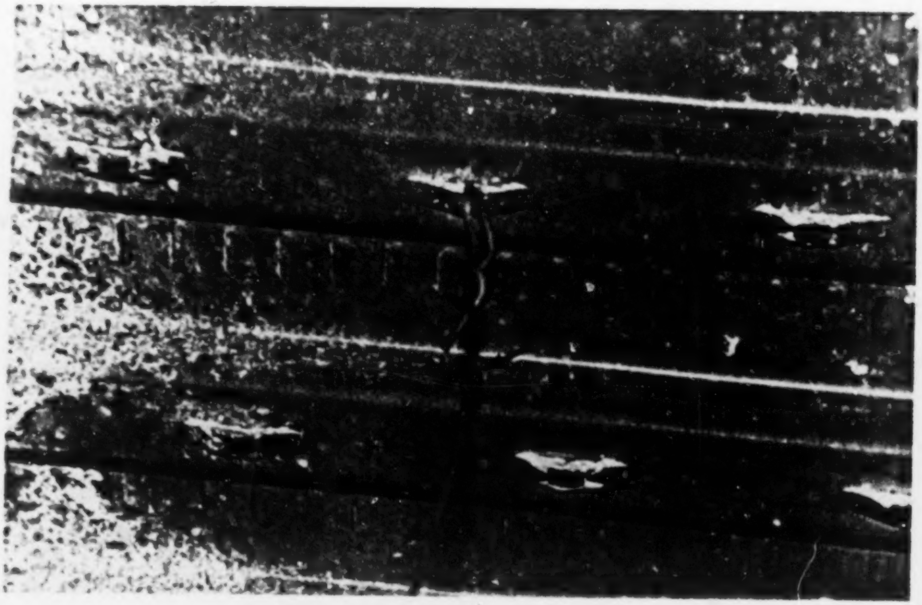
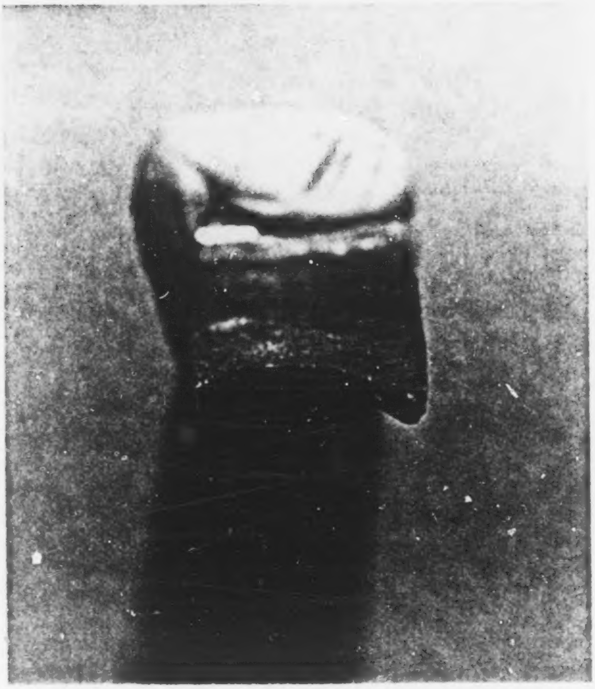


Fig. 14 HANGER WIRE - LOCATION 10E14

Photograph showing the same hanger wire as that shown in Fig. 13. It can be seen that the wire contains a twist or loop (arrow) which apparently was introduced during re-location of the wire.

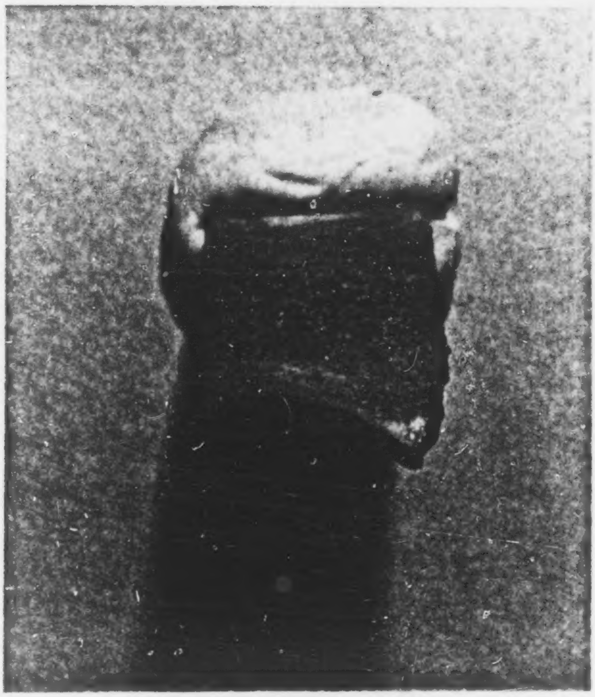


10 D 1

Fig. 15 "OLD" FRACTURED DECK TAB Approx. 5 X

Photograph showing rusted fracture surface exhibited by "old" fractured tab. It can be seen that the curved fracture surface shown here is covered with rust or corrosion product.

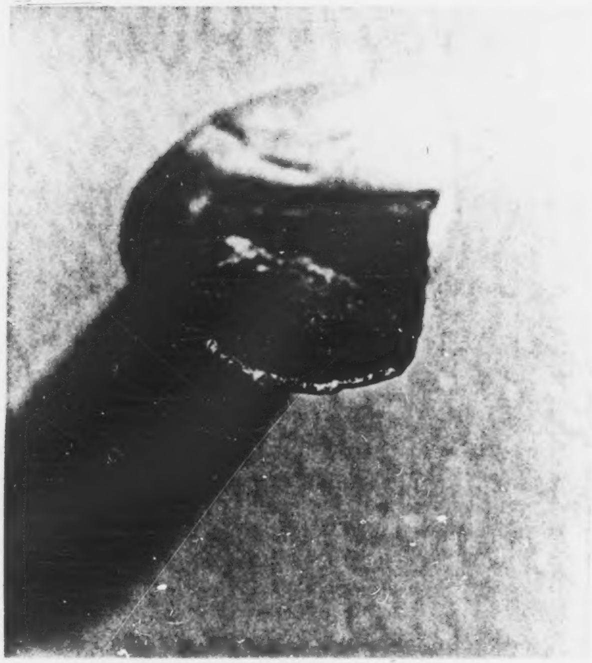
The presence of the rust or corrosion product on the fracture surface indicates fracture of this tab to have occurred at some long time prior to collapse of the ceiling.



10 D 29

Fig. 16 "OLD" FRACTURED DECK TAB Approx. 5 X

Photograph similar to that shown in Fig. 15 except of deck tab 10D29.



10 D 2

Fig. 17 "NEW" FRACTURED DECK TAB

Photograph showing bright, recent or "new" fracture exhibited by deck tab 10D2. This fracture, in our opinion, occurred on August 8, 1983 and was immediately adjacent to old fractured tab 10D1 shown in Fig. 15.

10 C 29

Fig. 18 "NEW" FRACTURED DECK TAB

Photograph showing bright, recent or new fracture exhibited by deck tab 10C29. This fracture, in our opinion, occurred on August 8, 1982 and was immediately adjacent to old fractured tab 10D29 shown in Fig. 16.

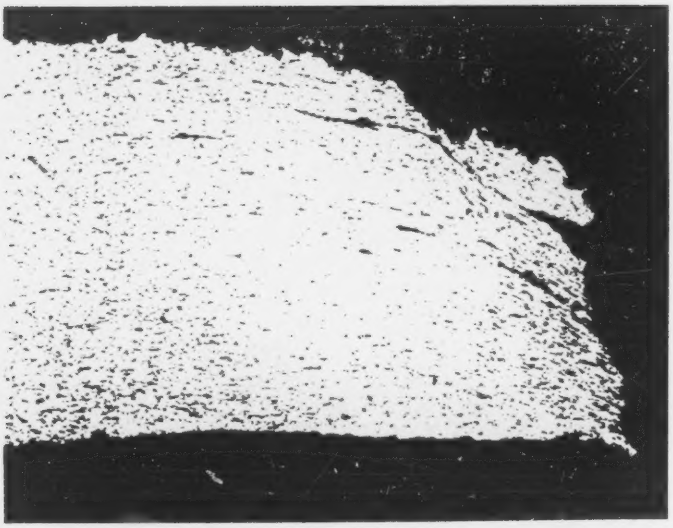


Fig. 19 "OLD" FRACTURED TAB 10D1 100 X

Photomicrograph of longitudinal section taken through fractured deck tab 10D1. It can be seen that the microstructure adjacent to the fracture surface exhibits severe grain distortion as would occur from shear overload.

The general microstructure of the deck tab material consists of slightly elongated ferrite grains (the iron phase) with a small amount of spheroidized iron carbides typical of a spheroidized, annealed low-carbon steel.

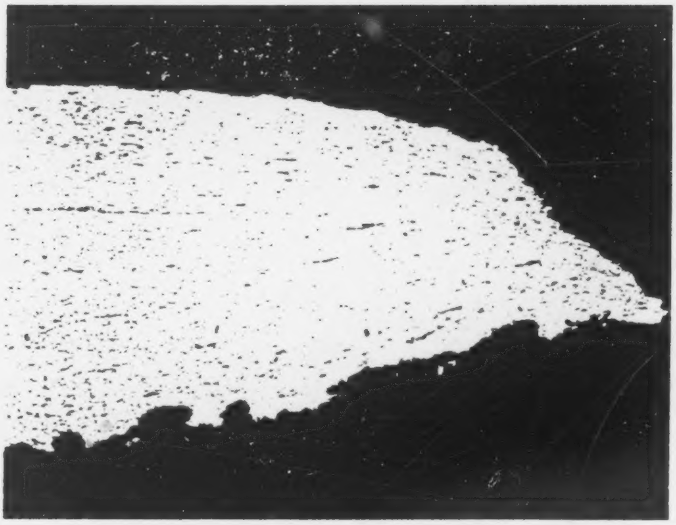


Fig. 20 "NEW" FRACTURED TAB 10D2 100 X

Photomicrograph of longitudinal section taken through fractured deck tab 10D2. It can be seen that the microstructure adjacent to the fracture surface exhibits severe grain distortion as would occur from shear overload.

The general microstructure of the deck tab material consists of slightly elongated ferrite grains (the iron phase) with a small amount of spheroidized iron carbides typical of a spheroidized, annealed low-carbon steel.

It can be seen that some insignificant localized pitting corrosion of the tab surface had occurred.

Fig. 21 TAB MICROSTRUCTURE 100 X

Photomicrograph of a longitudinal section of tab 5I14 showing the general microstructure which consists of slightly elongated ferrite grains (the iron phase) with a small amount of spheroidized iron carbides, typical of a spheroidized, annealed low-carbon steel. The thickness of the tab shown here is 0.032 in.

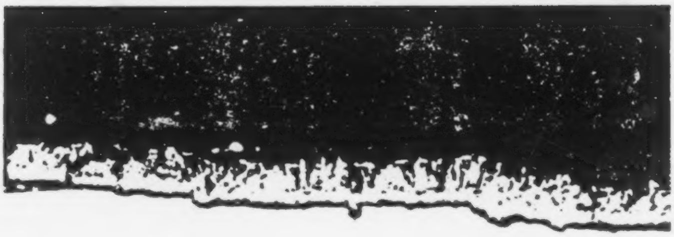


Fig. 22 ZINC GALVANIZE COATING 1000 X

Photomicrograph showing the zinc galvanize coating present on the surface of tab 5I14. The galvanize coating shown here is 0.0003 in. thick.

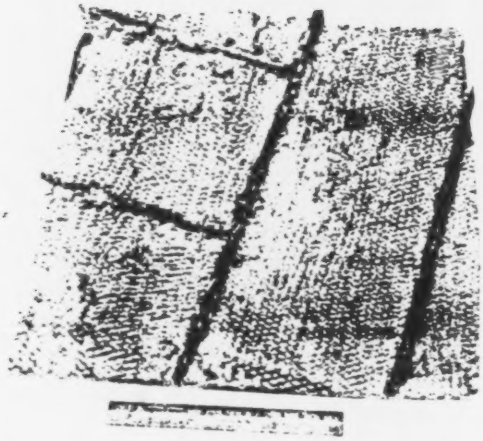


Fig. 23 SUSPENDED CEILING

Photograph showing a 24 in. x 24 in. section of suspended ceiling removed from the mezzanine level is of similar construction as the collapsed ceiling. The section of suspended ceiling shown here calculated to be 11.6 lbs. per square foot.

Mr. **Goldmark.** I want to stress to you and the other members of that committee, that this is not the final report on the investigation into the collapse, which both the port authority investigating committee and Lev Zetlin Associates are conducting independently.

Although many phases of the overall investigation are not complete, sufficiently conclusive information is available in regard to certain deficiencies during the original design and installation phase of the ceiling to warrant submission of an interim report.

Enough information is now available, to indicate that a design and/or installation deficiency contributed to the ceiling collapse. Mr. Tomasetti will summarize that in a minute.

Both the investigating committee and Lev Zetlin Associates are continuing their inquiries into the question of the roles and responsibilities of the various parties involved in the design and construction of the Journal Square Transportation Center.

While it would not be proper or possible at this point to deal with the specifics of matters still under investigation and where the record is not yet complete, I can say that the following general conclusions are emerging.

There was a failure in carrying out responsibilities and coordination in the design and installation of the ceiling.

Shoring to support the ceiling should have been used August 8 when the repairs began.

There were breakdowns in management and supervision of the reporting, diagnosis and repair procedures for the ceiling after a sag occurred in the spring of 1982, some 16 months before the collapse. This includes management and supervision of those procedures by port authority PATH personnel.

As in most tragedies of this nature, Mr. Chairman, the ceiling collapse did not occur because of one single, isolated error. The pattern that is emerging is one of a series of errors and deficiencies. The final report, when we are satisfied that we have fairly and fully evaluated all the relevant information available, will make specific identification of these errors and of the organizations of individuals which in our judgment are responsible for them.

At the same time another major phase of the investigation is centering on the reporting, diagnosis and repair procedures used once problems with the ceiling were observed.

And I would like simply to list for you and members of the committee the questions that we are addressing:

Was a reasonable diagnosis of the ceiling defects made?

Was there an inordinate delay between observation of ceiling suspension problems and the institution of a repair procedure?

Should precautionary measures have been taken when the ceiling problems were first observed?

Were the repair procedures appropriate and were proper safety precautions exercised for both employees and the public in instituting the repair?

Were there weaknesses in construction industry practices that contributed to the ceiling collapse?

Were there defects in ceiling installations elsewhere in the country and were they property communicated within the construction industry?

Were there deficiencies in design, installation, maintenance, repair, or management; and if so, what were the failures in responsibility and communication?

These are the questions that we intend the final report to address.

In addition to this investigation, we have retained the engineering firm of Ammann & Whitney, which is currently conducting an inspection and total structural review of the Journal Square Transportation Center. As a result of the work done to date, we have ordered, and Congressman Roe touched on this point, the removal of the suspended ceiling over the passenger platforms at Journal Square. This ceiling was secured and made safe by scaffolding immediately after the collapse, but it has been determined that this ceiling cannot be permanently reinforced, and therefore must be replaced.

The investigation is being pursued carefully, objectively and thoroughly. We are sharing the results of the investigation with appropriate state and local law enforcement officials as well as the USDOT and your committee.

I share the concern of your committee both that the investigation let the chips fall where they may, and that we not rush to judgment until all the relevant facts are obtained and evaluated.

Accordingly, the interim report deals with that area of the investigation which is substantially complete, and where I believe reliance can be placed on the findings. The final report will be equally thorough and painstaking in its effort to ascertain the truth and prevent the recurrence of such a tragedy in the future.

I would like, Mr. Chairman, Mr. Tomasetti to summarize for you briefly the findings of the interim report and then he and I will be glad to answer questions.

Mr. **Tomasetti**. Mr. Chairman, what I would like to do is I will first explain the nature of the ceiling construction briefly, where the failures occurred, what was the technical cause of the failures, and after that spend a minute on this model on your right, just to show you where in Journal Square the ceiling collapse was.

The nature of the construction of the ceiling, which unfortunately collapsed on August 8, 1983, is depicted in this dramatic sketch.

What you see here is the plaza level above, the structure up there and the ceiling at the concourse level is suspended from the plaza level. The ceiling is a very typical, standard type of construction called suspended cement plaster ceiling, which is made up of a gridwork of channels, something we call perforated lath, which is like a wire mesh, and a plasterer then applies the plaster to the solid concrete looking finish at the exterior.

This ceiling that is suspended at this level is suspended from wire hangers, which were attached to prepunched metal deck tabs.

The **Chairman**. How many feet?

Mr. **Tomasetti**. From here to here is approximately 8½ feet. And the reason for that in this particular construction is because of the nature of large structural elements at this point in the ceiling. That is why the ceiling is 8½ feet below the plaza above.

And when we look at the model, I think that will be even clearer.

Mr. GUARINI. The longer the footage, the more strain on the wire?

Mr. TOMASETTI. No; there is no connection. From a strength point of view, whether this is 2 feet down or 20 feet down, there is no connection.

I call your attention to this diagram. This is a closeup of the connection between the wire hanger and the tab. These wire hangers are approximately every 4 feet, 4 feet in each direction. And at this point the wire is wrapped around a prepunched metal deck tab which is provided from the deck above. This just gives an example of the location of the tabs.

The failure that occurred was the fracture of these metal deck tabs. Testing analysis which we have done through our metallurgist consultants indicated that these tabs had a range of stress varying from 380 pounds to 560 pounds. That is from quite a lot of tests which were done in place at Journal Square.

The weight of the cement plaster ceiling alone applies a load through the hangers on the average of approximately 200 pounds.

The testing we did also indicates, based on looking at the fractured surfaces of the broken tabs, we were able to determine that several tabs had actually failed prior to August 8, 1983. Approximately 24 tabs had failed before August 8, 1983.

This indicated that there was some history of broken tabs in the ceiling prior to the collapse.

We are of the opinion that this most likely occurred due to men walking in the ceiling prior to the collapse, which is a very customary thing in our industry, for a workman or a maintenance man or mechanic, whatever, he has to get into the ceiling to work on a pipe or something, he would walk into this type of ceiling.

So if you look at the arithmetic, if you have 200 pounds just from deadweight, if a man walks in the ceiling and happens to be stepping near a wire, you could imagine approximately another 200 pounds going into that wire, you could have 400 pounds of load here. And as I said before, our testing indicated a range of strength of the tabs between 380 to 560 pounds. There was very little margin of safety in the deck tabs.

The reason this happened, based on a study of the documents, is that during the design and construction phase, we are of the opinion that there was a coordination deficiency, which is the way we would phrase it, concerning the strength of these tabs, specifically the following:

The specifications for the deck indicated that the strength of tabs, that the tabs should not have more than 60 pounds of load applied to them. The shop drawings for the deck, which are the drawings that the manufacturer prepares and submits to indicate that this is the deck we are actually supplying, also had a note, reinforcing the specifications, indicating no more than 60 pounds of load, be applied to the tabs.

Now, it is important to note the way the specifications are done for various different trades in construction. On this project there were two separate contracts. One contract was the steel contract which included the deck work. In that steel contract were the specifications and the shop drawings, which I just referred to, for the steel deck. There was another contract called a general construction contract. In that contract were the specifications for the suspended ceiling system. So you have a different contract for the suspended ceiling system and also for the concrete that goes into the deck that is under the general construction contract, and you have a different contract for the deck.

During that construction phase, the information on coordinating the strength of these tabs, if they are used to hang the ceiling, was not properly coordinated, in our opinion.

Mr. GUARINI. Excuse me for interrupting. Are these both subcontractors of the general contractor?

Mr. TOMASETTI. No; the deck contract was directly to the construction manager on the project, which is the port authority. And the contract for general construction was under another contract which went to the construction manager, which was the port authority with their construction coordination consultant. Then within those contracts are a lot of subcontracts.

Under the general construction contract, you have a separate contract for the lapper who puts in the steel that supports and with him is the contract for the plasterer who puts the plaster.

Mr. GUARINI. Just so I may be clear, the project manager is the port authority. They supervise the work that is done. They let out a general contract. That general contractor has subcontractors, of which one of them is the person who dealt with the tabs, is that right?

Mr. TOMASETTI. I am not sure if the port authority was project manager. What I know at this point in our investigation is that the port authority with a consultant handled the construction management.

Mr. GUARINI. Either you have a project manager or you do not. Now, are they or are they not the project manager?

Mr. TOMASETTI. I am sorry. It is just that the term is construction manager.

Mr. GUARINI. Are they the construction manager of the project?

Mr. TOMASETTI. Yes.

Mr. GUARINI. So, therefore, they have complete control over the whole operation with their engineers in the port authority overlooking and supervising the entire building of this facility, is that correct?

Mr. TOMASETTI. That part of our investigation, Mr. Guarini, is continuing. What makes it difficult for me to answer is that the port authority also had a construction coordination consultant who was acting with them as a construction manager.

Mr. GUARINI. I do not want to be argumentative. But if you do not know 90 days after, when will you ever know if we are doing a thorough investigation, for which your association has a very fine reputation? If you do not know 90 days later, will we ever know what the chain of command was and what the individual responsibilities were that were in charge of this facility?

Mr. TOMASETTI. I believe we will know when we complete the investigation.

Mr. GUARINI. You mean you need more time than 90 days to find out exactly who was responsible for the various subcontracts and who was the construction manager, is that correct?

Mr. TOMASETTI. It is a matter that we have put our emphasis on determining what the technical causes were. We do know the general responsibilities. I think it has been published also who the various contractors were, what the roles of the different contractors were. As to whose responsibility this deficiency was, that is what we do not know at this time.

Mr. ROE. Will the gentleman yield? I think we ought to take the time out here for a minute and find out who, what, where, when, and why? Let us ask ourselves this question. What process does the port authority follow in its construction procedures across the board? Is it different project to project? Is there a regular routine that the port authority follows? In the final analysis, the contract is let and the contractor is under responsibility of the port authority, I would think, and you have different people you engage to do the work, is that correct? Different consultants and so forth and so on?

Mr. GOLDMARK. Different contracts, Congressman, and on different projects very often the work is packaged differently, and I think that is true throughout the construction industry. What is important here, since you have a specific collapse, in a specific building, is for us to identify and understand who was responsible for each step in each process in this building.

Mr. ROE. But let us not do that. Let us get to——

Mr. GOLDMARK. I have to do that, Congressman. I have to find out who is responsible.

Mr. ROE. I am here as amicus curiae and I am trying to get to the facts. What I am trying to get at is what procedure does the port authority follow when it is going to build a building of this nature? Do they keep control over part of the construction? Do they give it out entirely? What is the procedure you follow? Is there no set procedure where the port authority has a general set procedure in all of its construction sites?

Mr. GOLDMARK. There are a variety of ways of constructing public buildings, just like State government, local government, ourselves, there are different ways of packaging construction projects.

Mr. ROE. If the gentleman would yield further, I think what we are trying to get at—maybe you are answering and I am not hearing. You are saying basically that the port authority uses a host of different procedures. There is not a central set procedure basically to construction programs by the port authority.

Mr. GOLDMARK. I am saying there is not a single, unique way of constructing or managing. That there are very often different ways of packaging.

Mr. ROE. I am trying to get to one more point. Now, here we have the port authority, and I am sure that you have different people that are vice presidents or whatever their position may be, somebody who is in charge of construction. You have engineers. You have a construction agency, do you not?

Mr. GOLDMARK. We have engineers and we have construction units.

Mr. ROE. That is what I am trying to get at. So there is somebody, I assume, in the port authority physical structure that is in charge of construction, somebody that answers to you. Is that unreasonable?

Mr. GOLDMARK. No; the way in which construction is normally assigned depends on which line department is carrying out the project. In this case the line department was the rail transportation department. And, therefore, what we are asking in the case of this investigation is within that department and any other units of the port authority that may have been involved, and in terms of the assignments and responsibilities made to any of the private firms involved, who had what specific responsibilities. If I may elaborate for 1 minute. Specifically in the coordination efficiency that Mr. Tomasetti is addressing at this point, when Mr. Guarini asked his question, what would one logically have assumed to be the responsibility for following through on making sure the 60-pound warning was translated into construction.

Mr. ROE. I will then, Mr. Chairman, return the questioning back to Mr. Guarini.

The CHAIRMAN. Fine. We will get into it. What I would like us to do, if possible, I mean if it is absolutely necessary to interrupt to clarify one statement, perhaps Mr. Tomasetti may complete his statement and then we will certainly have all the time we want to ask all the questions we wish. Please continue.

Mr. TOMASETTI. Thank you. As I was stating, this coordination deficiency occurred, where more than 200 pounds of load was applied to a tab—which the documents stated—should have been no more than 60 pounds of load on.

The reason that the entire ceiling came down is that as the wires started becoming detached from the tabs, additional load was transferred to other wires and then to other tabs. The nature of the grillage construction here is a continuous nature. That is there is no total expansion joints through the supporting steel and hangers in the entire ceiling area around the entry path. There were control joints which were joined through the plaster and the lath.

The reason for these joints, in any event, whether they would have been put through the grillage or through the lath, is for expansion and for shrinkage effects in the cement plaster. So in this construction the joints were put into shrinkage and expansion, but the grillage was total all the way around, and that is why the entire ceiling collapsed.

If I may take a moment and explain on the model——

Mr. GUARINI. Mr. Tomasetti, excuse me, I just want this clear. Would you just explain this last sentence? "There is shrinkage and therefore that is why the ceiling collapsed." Was it that simple?

Mr. TOMASETTI. No, no; I am sorry if it was not clear, Congressman.

There were joints that were put in the ceiling through the cement plaster to accommodate for shrinkage, that is shrinkage of the material when it is drying, and for temperature effects, so the material does not crack.

There were no joints put in the grillage which supports the ceiling. So once this load transfer started, that permitted the load transfer to go around the entire ceiling.

Mr. GUARINI. Could there have been accommodation for shrinkage along your perpendicular joints?

Mr. TOMASETTI. Yes.

Mr. GUARINI. Was that defect in design?

Mr. **Tomasetti.** No; in our opinion the practice on whether or not you put joints in the supporting grillage is quite mixed in our industry. There is nothing in the governing code for this project which requires any joints in the grillage.

Mr. **Guarini.** But the more conservative procedure and the safer procedure is to do it, is that correct?

Mr. **Tomasetti.** No; that is not correct, because the only reason that joints would ever be put in is to take care of temperature effects. Shrinkage effects in this direction, so you do not have an esthetic problem of seeing cracks. [Model Displayed]

This is an example of a model of the south end of Journal Square where the PATH entry was. First let me explain it generally.

This is the concourse level. The escalators you see would be escalators going down to the PATH. This level here is the ceiling, the concourse ceiling, which collapsed. This is the plaza deck above from which the concourse ceiling is suspended. I think, Mr. Chairman, you can see there is quite a lot of deep structure in the ceiling and that is why the ceiling was 8½ feet below the plaza level.

The area of the collapse is over on the back end and I am not sure what your preference would be, but you would either have to look at the model at this end or should we turn it around?

The **Chairman.** If you turn it around, everybody else will have to come up here.

Mr. **Tomasetti.** This is the south end of the plaza area. This is the ceiling which collapsed. This is the plaza deck above it which it was supported from. This was supported by hangers.

We indicated in this area where the collapse initiated showing these type of hangers. This is from looking above, the type of hanger pattern that was in this area. It was in this area, based on the testing that we did afterward, and the inspection, that we uncovered the fact that it was approximately 24 of these hanger tabs that previously broke prior to the collapse. And the tabs that are red were the tabs that had previously broken and were not supporting the ceiling as of August 8, 1983.

The **Chairman.** So in this area where you have six tabs, five of them are red, which meant there was only one tab there.

Mr. **Tomasetti.** In this local area.

The **Chairman.** That means that virtually all of that fell on this one, or this one, or this one, because you have 7 of 10 out; 3 were then doing the work of 10.

Mr. **Tomasetti.** Right. Except that because of the continuous nature of the construction, some of that load actually was transferred. If it was not for the continuous nature, it might have come down a lot sooner.

Mr. **Guarini.** Can I ask of what material are the wires and tabs made?

Mr. **Tomasetti.** They are steel. The wires are steel and the tabs are in a steel deck.

Mr. **Guarini.** Was this all galvanized so that water or rust would not have any effect on it?

Mr. **Tomasetti.** The deck was galvanized and the wires were galvanized.

The indication, the visual indications on the deck and the tabs showed what looked like, at first, significant corrosion visually.

From our inspection, it was just surface corrosion. And we did tests on rusted tabs, tests on nonrusted tabs, went out in the field, and there was no difference of any significance between the strength of a rusted tab and the nonrusted. Sometimes the rusted tab was stronger than the nonrusted tab.

Mr. Guarini. Were the tabs galvanized as the wires were?

Mr. Tomasetti. Yes.

Mr. Guarini. Then it was all the same kind of material?

Mr. Tomasetti. All the same type of material, all galvanized.

Mr. Guarini. So it was actually the fracturing and not the rusting that caused the problem?

Mr. Tomasetti. That is correct.

Mr. Guarini. Did you have available all the materials that you could examine for this? Were they disposed of or did you have them available for your examination?

Mr. Tomasetti. We had available all of the materials. We were on the site from the first day.

The Chairman. Have you concluded?

Mr. Tomasetti. Yes.

The Chairman. Thank you very much. We appreciate both of you being here with your testimony. I know already that there will be some questions that will either be brought up or come to our minds that you may not be prepared to answer at this time. What we will do is, if anyone of my colleagues do have any questions, we will submit them to you in writing and get a response back from you so it may be part of the record. So we can be sure if anything comes up in a day or two, we will be able to have that in the record.

I am neither an attorney nor an engineer, so I may ask some very basic questions. I am in the middle because I have seniority.

Mr. Guarini. And a lawyer and an engineer on either side of you.

The Chairman. In your report, Mr. Goldmark, first of all, you say the final report will be released, "when we are satisfied that we have fairly and fully evaluated." I think an awful lot of people would like to know when that might be. You have had quite a bit of time. You have gone into it. You, I believe rightly, do not want to make any final determinations unless you have really fully investigated and know that you have the answer. I am not asking you for a date on which it must be in. I am just asking approximately when you think we will be able to say this is the report?

Mr. Goldmark. I cannot give you a date, Mr. Chairman. All I can do is assure you that we will act as quickly as possible.

The Chairman. Well, might it be 3 months from now or 4 years?

Mr. Goldmark. I do not know, Mr. Chairman. That is the most honest answer I can give you.

The Chairman. It could be 4 years?

Mr. Goldmark. I do not know is the most honest answer I can give you.

I think if you can compare the speed in which the interim report was done with comparable investigations around the country, you might be reassured. I think you will find it extraordinarily fast to get an interim report of this kind.

The CHAIRMAN. One thing you do say is "indicates," and lawyers can argue what "indicates" means, but you say that "design and installation deficiencies contributed to the ceiling collapse." By that I would take it for you to mean that you strongly believe that the design was not proper or what it should be. There was something wrong there. And the installation was not done properly. Is that what that means?

Mr. GOLDMARK. That is essentially correct. Let me make this a little more vivid for you perhaps. On page 53 of the Lev Zetlin Associates report, appears the actual note, Mr. Chairman, that was on the shop drawings in regard to these tabs. And if I could just read this note to the committee. On the shop drawing it was entitled note A, and it read on a note on the shop drawings, "If hanger tabs are used to hang plaster ceilings, sufficient tabs must be used to limit load to 60 pounds on any one tab."

Now, precisely as you state in your question, the reason we are calling it a deficiency during the design and installation phase, is because that specification restriction should have been translated into what was actually installed.

The CHAIRMAN. Well, I would take that in a sense to mean if it is correct that there should only be 60 pounds, and that is what the design called for, then maybe the design is all right, but if it did have 200 pounds, then certainly the installation was faulty, because apparently it did not follow the design that said only 60 pounds. Is that accurate?

Mr. GOLDMARK. Let me ask Mr. Tomasetti to explain why we phrased it very carefully, the phase of design and installation.

The CHAIRMAN. It seems to me very clear. If they said 60 pounds and they put 200 pounds, there was something wrong in the installation. They did not install what was called for in the design.

Mr. TOMASETTI. Just before the installation period you have what is known as the shop-drawing procedures, where the shop drawings are submitted, and are approved, and the shop drawings are used for the final construction. There is a variety of parties involved in coordinating those shop drawings, including the designers and the builders, and the construction managers. This note is on that shop drawing. And that note did not get properly coordinated, in our opinion, during that stage. So there are designers and contractors involved in that coordination process.

And at the point we are now, we simply do not know who dropped the ball in that coordination process.

The CHAIRMAN. Well, it could have been those who were responsible for the installation or it could have been those who were supposed to transfer in this shop, from what the designer said to what the installer got.

Mr. TOMASETTI. Correct.

The CHAIRMAN. That would seem to me to be that there apparently has been serious negligence somewhere. Maybe not the designer because he says 60 pounds and that is all right. But either the person, the installer, did not install it that way or the transmission, which I did not know that was different. I thought the installers would look at the designs and they would follow them, but apparently there is a step in between. Is that accurate, that area, somehow or other the word went out it ought to be 60 pounds, and yet when it was constructed it was 200 pounds? So somebody had to have been negligent.

Mr. GOLDMARK. That is a legal term. That is a key area. Let me use the term you used in your question, Mr. Chairman, is that is where the ball was dropped.

The CHAIRMAN. I do not want to hold you to this. We have a lawyer over here. I taught 6th grade English. Negligent means something in English, if it does not in law, so let us just give me a response as far as those who are not attorneys would know.

Mr. GOLDMARK. That is the process where the ball was dropped.

The CHAIRMAN. The average layman would say somebody has been negligent.

Mr. GOLDMARK. That is the process where the ball was dropped.

The CHAIRMAN. Any other person would say yes. We may go to court and prove that it was not in some way, but as far as I am concerned that is there.

Now, all right, so we had 200 pounds there which should have been only 60 pounds, right. Then you say, naturally, if someone stepped on that, you have a lot more than 200 pounds. You also said, I believe, that when one of these tabs would snap off, and the wire would, I guess, fall down, that then you attached it or didn't attach it at all or attached it to another one that didn't make much difference. So we were left at that point with it standing there, where you had seven out of eight in a row, with a lot more than 200 pounds on some of these wires.

Mr. TOMASETTI. Yes, Mr. Chairman. And as the report shows, in an analysis in one section of the report, which actually shows diagrams of what we felt the loads in the tabs were, after the 24 tabs had failed, the ones that failed prior to August 8. Approximately in that area, there was about 24 tabs, as I had mentioned. So the report does show that there are tabs that had higher than 200 pounds of load before August 8.

The CHAIRMAN. Just standing with no one walking through? So if you had an extra 100 on one to 300 and a 200-pounder walked in, you had 500.

Mr. TOMASETTI. That is correct.

The CHAIRMAN. Now, people went through, not necessarily to inspect but to do some other work. They were inspecting the tab.

Now, would it be reasonable to presume that as those people walked by, that is when some of the snapping took place? Is that when you got the extra pounds on there?

Mr. TOMASETTI. We are of the opinion that it is quite probable that the snapping occurred, the snapping of the tabs, while workmen were in the ceiling.

The CHAIRMAN. Did you have, or do you know yet, did you have anyone say: "Say, one of those things snapped while I was walking through"?

Mr. GOLDMARK. That is part of the area being investigated, Mr. Chairman. The record there is still very incomplete.

The CHAIRMAN. But you are looking into that?

Mr. GOLDMARK. We are looking into that.

The CHAIRMAN. It said in the report that when they snapped, and they snapped from the top, I guess, right?

Mr. TOMASETTI. Yes.

The CHAIRMAN. Sometimes they were attached to another tab, which means that people were aware that some of the tabs had been snapping. They had to be because they attached it to another one.

Mr. TOMASETTI. If I could explain. The report says, and you are entirely correct, we had found—we have what we call old breaks and new breaks. An old break is a break where the surface has rusted, which means it has been there for a while. And right next to that, maybe 6 to 8 inches, we saw a new break, where the surface of the break was very shiny, indicating it occurred on August 8.

As our report says, this indicates the possibility that wires that had previously been on one tab, after it broke, sometime prior to August 8, reattached to another tab prior to August 8. And there are five of them color coded in the model that show five of those that we found that we believe were reattached.

The CHAIRMAN. Which means then that somebody knew that they had snapped, because somebody had reattached them.

Mr. TOMASETTI. I would believe so.

The CHAIRMAN. So what we are talking about, as far as I am concerned here—not using the legal definition—is that there were mistakes in the building. Certainly what came out in the construction was not what was stated in this note A about the fact that they should have 60 pounds. They had a lot more than that.

Mr. GOLDMARK. That is correct. That is right.

The CHAIRMAN. Thank you very much. I may have some more questions later. I do not want to take up all the time. Mr. Guarini, Mr. Roe.

Mr. GUARINI. I yield to Mr. Roe first.

Mr. ROE. You go ahead.

Mr. GUARINI. Thank you. I understand you disagree, Mr. Goldmark, that all public authority buildings should be inspected by State and local inspectors. Was that your statement I saw in the press?

Mr. GOLDMARK. No; I do not believe so.

Mr. GUARINI. Are you fully in accord that the State and local inspecting bodies should have the opportunity to come in and examine, for the safety of the public, the facilities that you have?

Mr. GOLDMARK. Yes, we are, and that has been our practice.

Mr. GUARINI. You have cooperated completely and you agree that there should be local and State authorities with the right to protect the public coming in and inspecting your facilities; is that correct?

Mr. GOLDMARK. I am not sure what the last question means. Up till then I was with you.

Mr. GUARINI. You disagree with the fact that local and State authorities have the right to come in and inspect—should have a right to come in and inspect the facilities in order to protect the public?

Mr. GOLDMARK. We are opposed to their having that right by law, Mr. Congressman. In practice we have invited them, and welcomed them, and afforded them the opportunity to inspect our facilities at any time.

Mr. **Guarini**. Then why do you object if in principle you agree with the proposition that there be a law passed that would allow them to come into the port authority, where the port authority has been very well known to give very little accountability?

Mr. **Goldmark**. Because usually the issue raised by that law is the issue not of inspection, but of permits, and a permit, as you know, gets into a whole different area, involving not only time, but the criteria on which permits and certificates are granted. But we have never refused to allow inspectors. We normally file the plans of all our buildings with the local authorities. And I believe when the full record is developed we will be able to show that that was the case. Different issues from the Federal point of view: One is compliance and openness to inspection; the other is an additional legislative and legal step known as the review and granting of a permit.

The **Chairman**. Generally, just on that point, so I can understand also, what you are saying is you do not mind people coming in and inspecting all the time.

Mr. **Goldmark**. That is correct.

The **Chairman**. But you do not want to have to receive a permit for occupancy of the building from the locals or have the local people be able to come in and say we have the power to close you down because something is wrong. Is that what you are saying?

Mr. **Goldmark**. That has been our position, Mr. Chairman. Yes, sir.

Mr. **Guarini**. So therefore you are open to inspection and you do invite local or State authorities to come in and inspect all your facilities if they so desire.

Mr. **Goldmark**. Yes, sir.

Mr. **Guarini**. And the accident we have in question at Journal Square, has it been investigated by any other authority, to your knowledge, other than the port authority police?

Mr. **Goldmark**. To our knowledge, it has not been subject to the kind of investigation we are doing. As I said in our testimony, we are keeping informed the Hudson County Prosecutor's Office, the Attorney General of New Jersey, and a team from USDOT, that I think you will be hearing from later. But I believe we are the active investigating authority at this time.

Mr. **Guarini**. Was there any turning away by the port authority of any investigatory body that wanted to examine what had happened after the accident occurred on August 8?

Mr. **Goldmark**. Not to my knowledge, no, sir.

Mr. **Guarini**. One of the reasons I have brought up these questions is because I know that maintenance workers who are constituents complained about the ceiling in the Holland Tunnel. They were afraid of it falling; yet we were told that these maintenance workers were just a group of hotheads and that there was no grounds for their fears. Then the port authority shortly thereafter announced a $50 million maintenance program for construction and rehabilitation of the ceilings. It just seemed inconsistent with what I got publicly from the port authority from what actually happened in fact.

Mr. GOLDMARK. I believe, Congressman, in that case, your facts are mistaken. That ceiling maintenance program was announced 6 months before the incident you described.

Mr. GUARINI. But there was a serious problem as to the safety of going through the Holland Tunnel as far as an issue was raised by the maintenance workers who worked in the tunnel itself, is that not correct?

Mr. GOLDMARK. No. We do not believe there was a serious safety problem. What there was was an announcement and a program to replace that ceiling which is going to take 2 to 3 years, as the oldest underwater vehicular tunnel in the country.

Mr. GUARINI. Are you saying it was not an issue with the working men and the traveling public?

Mr. GOLDMARK. Some of the union leaders before a negotiation with us raised that issue. We believe that is being done with all the care possible, the replacement of that ceiling.

Mr. GUARINI. That is just an aside though. Mr. Tomasetti, how long should it take for you to complete your report? I know there are product liability cases that go into our courts that involve very, very serious matters with automobiles and with construction, et cetera, where from the time of the accident, from the time the case is tried, it might be 9 months or a year. Now, it has been 3 months since the accident.

Is it reasonable to assume it will be much longer before you can finalize your report with all the data and cooperation that has been made available to you?

Mr. TOMASETTI. Mr. Guarini, the reason it is hard for me to give an estimate is that in this phase we are in already concerning roles and responsibilities there is an interview process and various parties are being interviewed, and from those interviews we learn information sometimes that lead on to other interviews that occur. So I am participating in that process which is a total interview process which the investigating committee is doing. So it is only when all that information through the interviews is completely in that we would be able to complete our report. So I really cannot say when those interviews can be completed by the investigating committee.

Mr. GUARINI. Well, from the answers to Mr. Roe's and my own questions earlier, the chain of command seems unclear. Now is there not a table of organization and is there not a manual and a policy within the port authority, which shows where responsibility is pinpointed and who issued what regulations and who was responsible for the project? Shouldn't that be a simple matter to ascertain within the well-run organization that the port authority is?

Mr. TOMASETTI. Unfortunately, it is not a simple matter to ascertain. It is a simple matter to ascertain who were the various contractors, who was the architect, engineer, who the construction manager was and what their general responsibilities are. In our industry, there is a lot of coordination that is required during the shop drawing and construction phase. And what you typically find in many contracts in the construction industry is terms in a variety of the contracts that you will coordinate your work with so and so, and the other contracts says, and you will coordinate your work with so and so.

So there is a variety of people who are responsible to do this coordination. Where the coordination fell down, is the problem that has to be thoroughly investigated. And that is why it is not a simple matter.

Mr. **Guarini.** Mr. Goldmark, then, if this is the typical way that we can expect a project to be built, should the public have grave concerns then concerning the World Trade Center building in New York, concerning La Guardia Airport, concerning the Newark Airport, concerning Kennedy Airport, and the other projects that the port authority is responsible for?

If it is so hard to ascertain responsibility in the way that policy is run by the port authority, I would have, as a matter of being a member of the riding public, grave concerns when I enter into any port authority facility. After what I have heard this morning regarding the lack of accountability, why shouldn't I fear for my safety in any other port authority facilities?

Mr. **Goldmark.** I do not know, Mr. Guarini, what your standard is for expressing impatience with the rate of investigation. I share your desire to get to the answers of the questions you and the other committee members are raising.

I think if you look at the record of similar investigations, you would find that in some ways it is surprising we are as far as we are.

All I can say to you is that the best investigation is one that gives a really solid, hardhitting report. And to do that we have got to have all the information we need, and we have got to be able to evaluate it.

Mr. **Guarini.** Well, could this problem exist in other facilities? In the World Trade Center building? At La Guardia or Newark Airport?

Mr. **Goldmark.** I do not think that kind of speculation is useful at this point.

Mr. **Guarini.** But if it is so hard to be able to fix responsibility, if it is so easy then for things to fall between the cracks of the floorboards, then I should have serious reservations about any of your facilities. It is only by chance that hundreds of people were not killed in this one accident because it was just past the rush hour when this ceiling fell. If it had fallen only a few minutes earlier, the calamity would have been multiplied many, many fold.

I am just concerned that if this is the manner you conduct policy for construction by the port authority, and you have $5 billion worth of facilities, whether or not we should search carefully for other tragedies that can take place. And the port authority had no responsibility to the bridge that had its problem between Connecticut and New Jersey, Connecticut and New York, but we know how easy it was for a big section to have fallen.

Now, with the cutting of expenses in construction, and the manner in which modern construction is undertaken, if there is not a tightening of responsibility, we are liable to have other calamities take place. I want to ask you what is being done within the port authority to avoid that?

Mr. **Goldmark.** Your general concern is one we share. Following this incident, I ordered a review undertaken of every port authority facility from a structural and inspectional point of view, and I also asked for a review to be undertaken by every department of the normal cycles of review and inspection. And that reflects my concern that we do everything possible to reinforce the way in which we conduct our structural reviews to make sure they be done often enough and in a disciplined enough manner.

One of the interesting points that came out in the press conference that Mr. Tomasetti and I gave last week, is that the peculiar kind of design and installation deficiency that we are discussing here, probably in Mr. Tomasetti's point of view would not have been detectable by an inspector had he been on the scene.

Mr. GUARINI. Do we have wire hanging ceilings in other facilities throughout the port authority's buildings?

Mr. GOLDMARK. We reviewed all the other facilities, and we found two kinds of situations where that similar construction existed.

Mr. GUARINI. Could you say where they are, sir?

Mr. GOLDMARK. Yes. One is at Grove—well, there are other parts of Journal Square, first of all. As to Congressman Roe's earlier question. And the two other facilities where comparable construction, although not exactly identical was found, were the Grove Street PATH Station and the Delta Terminal at La Guardia Airport.

Now, our action fell into two categories. Where we were sure that the area was safe, we determined it was safe either because the deck thicker, therefore the tabs were capable of handling more load and/or the wires were spaced more closely. Remember Mr. Tomasetti's point that when you space them 4 foot on center, you produce 200 pounds on 60 pounds. So a combination of those means that that ceiling can be safer. Or, as in Grove Street, we found tabs were not used at Grove Street. A kind of ramset insert through the deck into the concrete is used, which develops considerably greater strength in the tabs.

Where there was any question in our mind, that ceiling was scaffolded. And I believe downstairs today you saw some of the places where similar ceiling construction has been used in the Journal Square transportation center. And that scaffolding, Mr. Congressman, will remain in place until either a way is developed for that ceiling to be reinforced or for it to be replaced.

The CHAIRMAN. If the gentleman would yield for just one question. This building then has been reinspected, checked out, scaffolding put where needed. You would state that this building at this time is safe.

Mr. GOLDMARK. Yes, sir.

Mr. GUARINI. Mathematically you can determine whether stress was adequate or not. Have the stress tabs been taken when the scaffolding was put up to make sure that it is safe, or were they just put up without any mathematical or engineering or scientific design?

Mr. GOLDMARK. I will get that answer to your question for you, Congressman, from our engineers. I do not know the answer off the top of my head.

Mr. GUARINI. Does Mr. Tomasetti know the answer?

Mr. TOMASETTI. I am not sure I understand the question.

Mr. **Guarini**. Was this just makeshift scaffolding that was put up or was it put up under engineering, scientific, mathematical stress tests?

Mr. **Tomasetti**. I recall in the initial part of our investigation, during the first week that we were there, the scaffolding was being put up, and the scaffolding was put up to hold the entire weight of the ceiling.

Mr. **Guarini**. Was it mathematically tested?

Mr. **Tomasetti**. The scaffolding?

Mr. **Guarini**. Yes. By sound engineering practices, professionally. Or was it just put up as scaffolding?

Mr. **Tomasetti**. As I understand, the scaffolding was designed, and calculations were done, to be sure that the scaffolding could take the load. Whether scaffolding was tested as an actual test of the scaffolding, I do not believe that was done.

Mr. **Guarini**. Can you certify that any test was taken or that scientifically we know it is safe for the public to walk under now?

Would you certify as an engineer, that this is so, or do you just understand that it is so?

Mr. **Tomasetti**. We were satisfied that that was safe and I believe there is a letter on record from our firm that from our perception of the scaffolding, and looking at the scaffolding, we would say——

Mr. **Guarini**. But you took no test. You said you looked at the scaffolding.

Mr. **Tomasetti**. That is correct.

Mr. **Guarini**. You would not certify as a professional engineer that it is safe unless you knew tests were taken, is that correct?

Mr. **Tomasetti**. No, that is not correct. It is not normal to do tests on scaffolding for holding up of ceilings.

Mr. **Guarini**. It is not normal, but this is not a normal situation. You have got a lot of concrete and a lot of weight load. This is unique as to anything that has happened in the past, in your experience, is it not?

Mr. **Tomasetti**. It is unique, but the way the scaffolding was put in, Mr. Congressman, because of the safety issue involved and the concern at that time, it was put in so ultraconservative that that scaffolding that was put in, it was obvious from inspection that it could hold up a lot more than the load of that ceiling.

Mr. **Guarini**. I will accept your statement that it is obvious from looking at it, all right. Although as a professional, I am sure that there are engineering principles that would apply, other than just to look at it.

Mr. **Tomasetti**. There were others involved who were also doing those engineering tests and everything, engineering calculations of the scaffolding.

Mr. **Guarini**. Well, you have 132 engineers, Mr. Goldmark. Would you certify that tests were taken as to the adequacy of the scaffolding that was put up?

Mr. **Goldmark**. I stated earlier in response to your question that I do not know the answer to that, and I will be glad to get you the answer as to what kind of stress tests, if any, were made.

Mr. **Guarini**. That is satisfactory and we will put it into the record.

Mr. Tomasetti, was it not inevitable that some day the ceiling was going to fall, whether it be 10 years, or 15 years, or 20 years, or 30 years after construction?

You know that the Roman Coliseum, the Parthenon, and other contemporary buildings are still standing and they were built 2,000 years ago. Is it not true, that with the concrete weight on these 60-pound tabs that some day there was going to be a tragedy? It was just a matter of when? That it was a time bomb?

Mr. **Tomasetti.** Mr. Congressman, I cannot state whether or not it was inevitable that this ceiling was going to come down. But the fact that I could not state that it would have stayed up forever either. So what I can state from our inspection is that the ceiling did not have the proper factor of safety. That is correct. But I cannot predict whether it would have come down anywhere anyway, given some other——

Mr. **Guarini.** With the vibration of the subway, with water that sometimes gets within the ceiling, with people that walk on it in order to make inspections, you have got 60-pound tabs. Are you saying that you do not think that this ceiling would eventually have fallen down?

Is it not designed for tragedy?

Mr. **Tomasetti.** Mr. Congressman, I am sorry if I was not clear. I said I could not say that it definitely was going to come down in any event. Given the same similar events where people were walking in the ceiling and the loads were put in the ceiling, which are customary to be put in the ceiling, that may happen at some other time, and had not happened at this time, it is my opinion, given those same events, when they would have happened that you would have had the same result.

Mr. **Guarini.** You would not build a ceiling this way, would you?

Mr. **Tomasetti.** No, I would not.

Mr. **Goldmark.** Could I comment on that question, Mr. Guarini? I think you heard the very careful statement of a professional engineer. As a layman, I think the commonsense answer to your question is yes, it was almost certain that this ceiling had to come down some day, given the way it was built and put up.

I want to underline that it did not have to do, in our opinion, with either the subway or the water. It did have to do specifically with the issue of the tabs. I think it is fair to say that this ceiling had failure designed into it. I think you are right.

Mr. **Guarini.** And other parts of the ceiling will fall probably if it is not replaced?

Mr. **Goldmark.** I do not believe the ceiling will fall.

Mr. **Guarini.** There are cracks in the ceiling. You have inspected those. Are there other danger spots that exist now?

Mr. **Goldmark.** Those are presently being reviewed top to bottom by a complete structural inspectional review and it is not our belief that any other part of that ceiling is going to fall.

Mr. **Guarini.** How much Federal money has been spent, $39 million?

Mr. **Goldmark.** Approximately.

Mr. **Guarini.** Was there a cutback in design in order to save moneys in the construction of this building?

Mr. **Goldmark**. Not in this area. Not in the area of ceilings. I do not mean to imply that there was not in some other area. Simply that is one obvious question we are asking in our investigation. And to this point, there is no sign that this was a result of any costcutting.

Mr. **Guarini**. Let me put into the record, if I may, a letter that was written by the port authority on July 11, 1974, which was about the time that this was constructed. And apparently the letter was written to a member of the public, a Mr. Irving Grossinger of 12 Perrine Avenue, Jersey City, who was concerned about the quality of the construction as it had been built at that time. This letter was written around the time the PATH facility was constructed.

The **Chairman**. Without objection, the letter will be made a part of the record.

[Letter referred to follows:]

JERSEY CITY, N.J.,
September 12, 1983.

Hon. FRANK J. GUARINI.

DEAR FRANK: Came across the enclosed July 11, 1974 letter from PATH. On page 2 they discuss the use of concrete. After what happened in Jersey City, I wonder if similar uses of concrete throughout the Nation, was used in order stay within budgeting guidelines on government-funded buildings.

Sincerely,

IRVING GROSSINGER.

PORT AUTHORITY TRANS-HUDSON CORPORATION,
New York, N.Y., July 11, 1974.

Mr. IRVING GROSSINGER,
Jersey City, N.J.

DEAR MR. GROSSINGER: Thank you for your recent letter and comments about service at the Port Authority Trans-Hudson (PATH) system. I regret that you have had difficulties with trains being removed from service at Journal Square because of malfunctioning equipment and other difficulties. I was pleased to note, however, that our passenger bulletins have helped you and other passengers understand some of the problems which PATH encounters and the efforts which are being made to solve them.

In your letter you mentioned several specific problems which you have experienced, and I would like to provide you with an explanation. In regard to trains pulling out of the Journal Square terminal in advance of their scheduled departure time, the staff of our Transportation Division informs me that this is not possible under our standard operating procedure. Trains at the terminal are dispatched by an automatic train dispatcher and, therefore, they should not be leaving early because they will not have received the necessary signal. I have asked staff to check these instruments to assure their proper operation in the future.

In regard to clocks at Journal Square, let me assure you they will be installed in the near future as construction is completed on both concourse and platform levels.

You also mentioned the fact that there is only one escalator going up from the concourse to the plaza level, and that this creates a bottleneck inasmuch as there are two escalators going up from the train platforms. Actually, this is part of the design of the Transportation Center. When the new bus terminal opens in the Fall, bus passengers will be able to go directly to their buses by using a separate entrance and escalators on the main concourse level. This, in turn, will provide more room on the "up" escalator to the plaza level for other PATH passengers.

In regard to the design of the new PATH Transportation Center, so far we have not had any difficulty with snow but will certainly monitor the situation. The Administration Building, which you also referred to was built as simply as possible. Throughout that building and the entire complex itself, there is extensive use of concrete, which is the least expensive building material available. Although we have been helped considerably by Federal funds, we have constructed the Center under very strict budgetary guidelines. We have made reasonable allowance for aesthetics and landscaping in the interest of providing Jersey City with an attractive public facility that will enhance the environment.

Thank you again for taking the time to send us your constructive comments and also for your kind words about our communications to passengers.

Sincerely yours,

LOUIS J. GAMBACCINI,
Vice President and General Manager.

Mr. GUARINI. I would like to read the last paragraph and ask you for your comment on it because I think that this should be brought to your attention in a complete investigation. I would like to have the answers on this.

Mr. Lou Gambaccini, who was the vice president and general manager at that time, said to Mr. Grossinger:

> In regard to the design of the new PATH Transportation Center, so far we have not had any difficulty with snow, but certainly will monitor the situation. The Administration Building, which you also referred to, was built as simply as possible. Throughout that building and the entire complex itself, there is extensive use of concrete, which is the least expensive building material available. Although we have been helped considerably by Federal funds, we have constructed the Center under very strict budgetary guidelines. We have made reasonable allowances for aesthetics and landscaping in the interest of providing Jersey City with an attractive public facility that will enhance the environment.

Now what this says to me, in this letter by your vice president, is that that they have cut back in the design, and have used the cheapest material available. They had given a little more consideration for esthetics and landscaping, and that they have built the facility in a manner which would prevent the use of the kind of funds that were necessary in design to safeguard the public.

I want to show this to you and I want to ask you for your comment on it, just so that you could advise us as to what your opinion is.

Mr. GOLDMARK. I would be glad to take a look at the letter, and I have already told you that one of the questions we are asking was were there any cost cutting steps here that should not have been taken.

Mr. TOMASETTI. I am not familiar with this letter, but just related to the things concerning the construction industry, the term "the use of concrete which is the least expensive building material available." Concrete is used extensively throughout the country and the world. It is one of the most major of building materials that are used.

Mr. GUARINI. On ceilings, sir? Or is that a new mode of cheaper construction?

Mr. TOMASETTI. No. Actually the cement plaster ceilings here is a very expensive type of construction for exterior. The reason they use the cement plaster, because it stands up. All the existing ceilings, even the photos of the one that had collapsed had no cracks in it. It was standing up very well.

Mr. GUARINI. I see cracks downstairs. Does that mean that those ceilings have problems where I see cracks in them? Does that mean that there is a potential hazard where these ceilings sag?

Mr. TOMASETTI. If there is a crack in the ceiling itself, Mr. Congressman, it does not necessarily mean it is a potential hazard.

Mr. GUARINI. But it could be? It requires looking into seriously if you are going to protect the public?

Mr. TOMASETTI. The cracks in ceilings and cracks in concrete, it depends on the nature of the cracks.

Mr. GUARINI. Would you not investigate it?

Mr. TOMASETTI. It depends on the observation. If it is a very minor-looking crack, it is a very typical thing to have in concrete.

Mr. GUARINI. What about a belly? Would that concern you very seriously?

Mr. TOMASETTI. You mean a sag?

Mr. GUARINI. Yes.

Mr. TOMASETTI. I would say if there is a sag, it should be looked at, yes.

Mr. GUARINI. Have you seen any sags downstairs, because I have a sag right near my congressional office downstairs.

Mr. GOLDMARK. If you have a specific sag that you would like our opinion on, please tell us quickly.

Mr. GUARINI. I think that you should, with 132 engineers.

Mr. GOLDMARK. We have looked at them. If you have another one that you would want looked at again, tell us. We have looked at them.

Mr. TOMASETTI. There were a lot of sags looked at.

Mr. GUARINI. Does water get into this dropped ceiling that you have, and cause a heavier load to be put on your wires?

Mr. TOMASETTI. Water can only get in the ceiling if there was a leak in the pipe. It would take a tremendous amount of water to put any significant load on the ceiling.

Mr. GUARINI. Would you just further comment on the letter and then I will pass to Mr. Roe.

Mr. TOMASETTI. I was just finishing my comment that by the statement that concrete is the least expensive material. I guess one of the reasons we use concrete so often is because it is an economical material. And that is usually our job in this industry to use economical materials.

The CHAIRMAN. The gentleman from New Jersey, Mr. Roe.

Mr. ROE. I have listened intently to the explanation and I think we have an obligation and I know you share that. I think that the port authority has been responsive in your statement where you said that there is a deficiency of some type. And I think we are looking at two issues: one is the liability issue; and the second is the safety issue. And not in that order. First is the safety issue and second is the liability.

So when you speak to the issue of the timeframe in completing your technical analysis, you are trying to nail that down. Once being in the construction business, I understand what you are talking about. You are trying to nail that down.

But with 2 people having been killed here and 12 injured, I think the one major thing that should come out of our hearing today, and we have been getting those questions back and forth, is the present building structurally sound. It is going to take us 3 months, 2 months, 5 months, whatever to nail responsibility. That is one thing. But I think we have to reassure the people, No. 1, that the building is structurally safe. And are we prepared to say that?

Mr. GOLDMARK. Yes, we are, Mr. Congressman. I want to be specific on that. As I described earlier, I believe, to a question of either the chairman or Congressman Guarini, every ceiling has been reviewed and inspected in this building.

Mr. **Roe**. That is not the question I am asking.

Mr. **Goldmark**. I am trying to get to your question.

Mr. **Roe**. Let me clarify the question. We seem to keep coming back to the ceiling. I think the ceiling is a manifestation of an issue, basically, fundamentally, is the structure safe and sound? That is the question specifically.

Mr. **Goldmark**. Let me try the answer again. Every ceiling has been inspected and reviewed here.

I am trying to answer your question.

Mr. **Roe**. You keep getting back to the ceiling. I think the ceiling is one manifestation.

Mr. **Goldmark**. I agree.

Mr. **Roe**. Let the ceiling go. I have questions on the ceiling. Is the building structurally sound? Have we inspected it in 4 months time and said, Yes; it is structurally sound?

Mr. **Goldmark**. The rest of the building is in the process of a total, in depth, structural review and inspection and no serious problem or minor problems have been found so far.

Mr. **Roe**. OK. So all I want to get on the record at the moment, maybe my question is not clear, we are saying that we are continuing to inspect the building for its structural soundness? That is either yes or no.

Mr. **Goldmark**. Yes; we are.

Mr. **Roe**. How long will it take? Because I think that is a paramount issue. How long will it take to complete that technical structure review, so that people who go through this building know that the building is safe? That is a simple question.

Mr. **Goldmark**. The firm that is doing that intends to complete that review by late December or early January. I want to stress we know of no reason to conclude that it is unsafe.

Mr. **Roe**. Nor am I suggesting that. I am simply saying that the port authority is being responsible and has looked beyond the ceiling issue, and they are taking a good look at the entire building and that report will be forthcoming sometime either in December or early January.

Mr. **Goldmark**. That is correct.

Mr. **Roe**. So, therefore, we are being responsible. We are looking into that particular issue?

Mr. **Goldmark**. Yes, sir.

Mr. **Roe**. Forgetting liability, but looking at the ceiling, I have noted when I went down, you have shored the ceilings up.

The next question I would like to ask, we know there is a deficiency in those ceilings. And we know they are going to have to be replaced, either replaced or strengthened, one or the other. Are we doing something now technically, designwise to get that done at an early date?

Mr. **Goldmark**. I do not have here the date by which those sections that are going to be reinforced and replaced will be done. There is one section, Congressman, that we have determined must come down because it cannot be reinforced or replaced where it is and that is the section of the ceiling that is presently scaffolded over the platform down on the track level. There is not room or the opportunity there to reinforce and replace it. We have determined that that is going to come down and that work will be starting very shortly, simply to take it down totally.

Mr. **Roe**. Therefore, to sum up on this particular issue, what we are saying is we want to reassure the people, because the port authority is a very important organization. You do a great deal of construction and you are responsible. We are coming back and we are saying, first, that we will conclude our physical inspection, our technical inspection of the building for safety sake. Secondly, what we are going to do is replace those ceilings as quickly as possible.

Mr. **Goldmark**. Replace or strengthen, yes, sir.

Mr. **Roe**. So we are not really saying if it takes the engineers and the legal people to review further what the ultimate liability will be, they are not waiting for that. I think that is so important. It was coming out that maybe we were going to wait another 6 or 7 months, we are not doing that.

Mr. **Goldmark**. No.

Mr. **Roe**. As far as the safety of the people is concerned, the structure of the building, and replacing those ceilings and reinforcing those ceilings, that is going to be done at the most proficious time.

Mr. **Goldmark**. Yes, sir.

Mr. **Roe**. Let me ask a second question then. I do not think we can use a line of questioning that is going to bring a solution to this until you finish your inspection work, except for one point. That I think is another reassurance the port authority ought to be making to its constituency' is that, do you have a structure, are you reviewing your business structure, your engineering structure—that is the wrong word, engineering process now that this has happened. Unfortunately, this tragedy has happened. And now are we setting up a tighter coordination, because we spoke of the coordination being part of the problem and I can understand how that happened.

What are we doing at the port authority level to reassure ourselves that we have the business, professional structure put together so that we get these things before they happen? It is not enough just to nail down, Peter, is what I am trying to get at, who was at fault here. Have we set new processes going in port authority so we can get a better handle on two things? One, a better coordination, which we are responsible; and two, the safety of the people.

Mr. **Goldmark**. The question is right on the mark, Congressman Roe. As of this moment, we have not set in place or designed new processes because I need to understand (a) the breakdown that we have called here a coordination deficiency. And there was another large area, which we need to understand precisely the breakdown, and that is one we mentioned briefly in the introduction, during the repair process. This came out in this testimony. This sagging problem was noticed many months before the collapse. It was a totally different area of breakdown which we are investigating that occurred many years after the design and installation, and that is what I referred to as during the period of repair.

So in both those areas, we will be instituting new procedures, new policy, timing, but I cannot do those until we understand the breakdown.

Mr. **Roe**. I am satisfied now after your testimony on three points. One you have to nail down someplace a responsible liability issue here involved. And you need additional work and study and review to do that.

Two, you have identified the deficiency that existed in the metal tabs and you have shored those areas up. You are moving in the direction of correcting that sometime in December. Or you are going to start on that relatively soon. The third thing you testified, as far as this building is concerned that you are looking at the structural relationship of this building to reassure the people it is OK.

We should have learned something here and it is important to what is happening throughout the Nation here, is what we are saying. We have learned something here. The port authority is perhaps the largest constructor in the metropolitan area. And you mentioned yourself, as the question you responded to Mr. Guarini, that there were two other particular areas looked at, one was the Delta Terminal building. There was another one you mentioned.

Mr. **Goldmark**. The Grove Street.

Mr. **Roe**. So that you are then responsible. You are looking into where these kinds of ceilings are involved. We are trying to be a help here. But the question is, is port authority as an organization not just dealing on this issue. Have we looked through our whole methodology, the way we operate, to say how did this coordination, what fell apart, but are we coordinating? Is it a lesson that is learned, that the port authority is looking at its organizational structure, its engineering structure, its method of handling contractors' its method of interlocking contractors involved, to improve immediately the port authority's process in these kinds of contracts? Because that is going to reassure the people that you are taking another look to be sure of the safety issues involved.

Mr. **Goldmark**. I understand the question better. The answer to that is yes, that is being looked at, as well as inspectional and safety issues we mentioned earlier. Yes, sir, that is being looked at.

Mr. **Roe**. Can we look down the road for a response from port authority, when you are prepared—in fact, it might be helpful now, not today, but with responding in writing, can you respond to this committee and says "We are aware of the problems. We understand what is happening. And we have now reviewed our whole methodology of reviewing these contracts."

Because if Congress is going to take some direction in either strengthening the law, the OSHA law, whatever is involved for responsibility, this is a classic, unfortunate tragedy that caused this whole review to take place in the first place. And we ought to be sending that to port authorities and other groups throughout this Nation, that they are responsible to find an answer.

Mr. **Goldmark**. I would be glad to submit that.

Mr. **Roe**. So if we could get that at an early date, what process you follow, that could be extremely helpful in anything the committee may suggest in the way of what revision ought to be done on a nationwide basis. Is that reasonable?

Mr. **Goldmark**. Yes, sir.

Mr. **Roe**. That is all the questions I have.

The **Chairman**. Thank you very much. Mr. Guarini has one more question, I believe.

Mr. **Guarini**. Just 1 minute, very, very quickly. As I understand, you have checked all the other facilities, Peter, and there are no such ceilings as these in the World Trade Center or Kennedy Airport or other areas? Or have you had an opportunity to check all the facilities of the port authority?

Mr. **Goldmark**. We have reviewed all of the facilities and have not found any that are similar or comparable to these.

Mr. **Guarini**. Now, the economics are very, very important, too, because this work to change all the ceilings and construction and this loss of business at Journal Square cost the riding public a great deal of money. There are a number of things that are involved which are going to be expensive. I bring this up because the PATH fare went from 30 to 50 cents and the public is afraid that it is even going to be higher than that, which I hope will not happen because it will only hurt the economy of the whole area.

Are there performance bonds or other insurance to see that the port authority will recapture the costs of this tragedy? There are all types of liabilities for which you will be responsible. Not only the injuries to the people, but to the business, and the replacement of the ceilings. There are many things that have occurred. Your cost of examinations and inspections. All of these things are expensive to the riding public. I am concerned about the fare that went from 30 to 50 cents.

But the fact is we do not want to have any further increases in fares than what we have already had. Is there any assurance that you can give us that you are legally protected to recoup all the moneys you have lost as a result of this accident?

Mr. **Goldmark**. I think you as an attorney know better than I, Congressman Guarini, that there are no absolute assurances in this area. Two preliminary judgments may be helpful to you. One, it is our preliminary judgment and I am advised by counsel, that most of this situation is covered by an insurance policy that applies. Now, whether that is challenged by the company and how that is finally resolved, I cannot tell, but that is our starting preliminary judgment. Although I must stress that our guiding concern here has been safety and structural integrity, not cost.

The second item represents a deliberate position on our part to be flexible, in terms of the rent charged to businesses in that area who have had their business and flow of coerce interrupted.

Mr. **Guarini**. But the public is paying for this, no matter how generous you are. It is a public facility. And what I am asking is whether or not there are performance bonds for the contractors who made the mistake which will cover the expenses? Have you looked into that?

Mr. **Goldmark**. We have looked into it. We have no clear answer to that on whether there are performance bonds that will cover. I think the bulk of the expenses of the liability here is covered by an insurance policy that applies.

Mr. **Guarini**. But I do have your assurance that you would look into all forms of insurance and performance bonds to make sure that all the responsible people are brought to task and that the rights and remedies of the public will be protected through the port authority.

Mr. GOLDMARK. Yes, sir.

Mr. GUARINI. This last question. What recommendations, now that it has been 3 months since this accident has taken place, could you preliminarily give us, so that there could be either certifications of the building facilities, assurances and suggestions that we do not have an accident of this kind again, and what kind of Federal legislation would you recommend to this committee at this time?

Mr. GOLDMARK. I would like to stop short of recommending legislation, partly because we still have so much to learn here. But I would like to share with you a couple of thoughts that may be of use to you and the other members of the committee.

First of all, is that we have learned that in this area there is no official Federal clearing house or procedure. Now in the aviation industry, where the port authority is also active, there is a very clear and specific notification machinery in terms of problems. In the automotive industry, as you gentleman are familiar, there is a very specific procedure. There is not, to our knowledge, we may be incomplete, there is not, to our knowledge, a specific, federally authorized procedure, by which information and possible recall or correction machinery can be triggered through a central clearinghouse. And that has at least struck us at this preliminary point in terms of our efforts, as we ask ourselves very logical questions where else were decks with these tabs supplied. It turns out that is very difficult information to get.

So I at least raise that question for your consideration as one that has struck us at this point in the interim findings.

Mr. GUARINI. You have no problem with the fact that if Federal moneys are put into a project, the Federal Government would come in, certify the design, help to supervise the construction, and periodically make examinations every so many years?

Mr. GOLDMARK. Congressman, let me be very careful in my answer. I have no philosophical quarrel with that. I would like to very much discuss with you at a later point the terms which that is done, because sometimes that involvement can be something that leads to tremendous delay and cost problems without any improvement in safety, and therefore I would like to, keeping open the question of the terms and the way in which such reviews and approvals are given.

Mr. GUARINI. You mean you haven't any reservations as to whether or not the Federal Government, if it gives you money, should supervise the way that money is spent? That it should look at the design and construction of the facility to make sure that the public is safeguarded?

Mr. GOLDMARK. Yes, sir. I have found in serving at all three levels of government, that there are no magic governments with magically perfect powers and reviews, and while I have no philosophical problem with a project that receives Federal money, being subject to Federal oversight, and review, the terms under which that is done I think bear a great deal of importance. Many times we have in this country and I must be very frank, we put review on top of review on top of review and wind up with nine or ten agencies involved, each one pointing like this. And I personally believe a great deal of attention is drawn to the issues of accountability that go with those reviews and with those approvals, and that is why I specifically would like to reserve on the question of how any approvals and reviews might be done under that kind of arrangement.

I have no philosophical quarrel with the general proposition that a government that puts money into it should have some responsibility and right to oversight.

Mr. **Guarini**. Just so I can be clear, if there is an accident that takes place on a train, the Government will come in right away and make inspections of the trackage, the equipment, and how the accident happened, is that correct?

Mr. **Goldmark**. That is correct.

Mr. **Guarini**. Now, why should not the Government come in if there is an accident where the riding public is injured walking through a building? Should not they get the same protection from the port authority? Where is the difference in your philosophy?

Mr. **Goldmark**. That is not the philosophical difference. The Federal Government should have that right and they do have that right. That is not at issue.

Mr. **Guarini**. So you do agree that the Government should have the right to come in and at least certify the safety of the building or do you disagree with the premise?

Mr. **Goldmark**. Certify the safety of the building after an accident, or during construction?

Mr. **Guarini**. No; I mean during the construction and periodically thereafter, say every 5 years, to assure the riding public that there is a safe place for them to go into.

Mr. **Goldmark**. I have no philosophical quarrel with the idea of a Federal role in approving its safety. Like you, I have seen hundreds and thousands of bureaucratic certifications and reviews and I would be glad to discuss with you the terms and way in which those might be done to make those realistic and effective, as opposed to just another piece of paper and a pile of papers. I think that is the challenge.

Mr. **Guarini**. I thank you very much, sir.

The **Chairman**. We wish to thank both of you for your appearance here today, for your bringing us up to date on what you do know at this time. We look forward, as soon as practicable, being able to see the final report. And of course at that time we feel that there will be recommendations and information which certainly all levels of government will respond to based on information we do get from your investigation.

Thank you very much. We will be in touch with you further because these hearings will be continuing.

Mr. **Goldmark**. Thank you, Mr. Chairman.

[Subsequent to the hearing, the following was received from Mr. Goldmark:]

THE PORT AUTHORITY OF NY & NJ,
New York, N.Y., November 30, 1983.

Hon. JAMES J. HOWARD,
Rayburn House Office Building,
Washington, D.C.

DEAR MR. CHAIRMAN HOWARD: During the course of hearings by your Committee relating to the accident occurring at the Journal Square Transportation Center in Jersey City, New Jersey, several questions were asked of the Port Authority that required a detailed written response. Leave was granted to provide in writing the information requested. We request that the following be made a part of the record of the proceedings and accepted as a supplement to the testimony already presented.

A number of questions evidenced a concern regarding the design and testing of the scaffolding temporarily being employed at the Transportation Center. Specific questions were asked relating to the design capacity of the scaffolding. The scaffolding that was installed subsequent to the collapse of the ceiling in the Center was installed by the Chesebro-Whitman Company, a division of Patent Scaffolding Company, a division of Harsco Corporation. The scaffolding which was designed to support a minimum of fifteen pounds per square foot was designed by a professional engineer who is an employee of the Scaffolding Company. In certain areas timber scaffolding designed by a member of the Port Authority Engineering Department was utilized and in those cases, a design minimum of fifteen pounds per square foot was also employed. A member of the Port Authority Engineering Department with the concurrence and approval of the Assistant Chief Structural Engineer and Mr. Richard Tomasetti of Lev Zetlin Associates determined which ceilings were to be supported. While the scaffolding continues to be employed at the Center, the scaffolding contractor will have an experienced union carpenter foreman on duty at the facility from 5:30 AM to 1:30 PM, seven days a week to maintain and inspect the shoring. This is in addition to weekly visual inspections of the Patent Scaffolding Shoring System that is conducted by the contactor's engineer; also a qualified engineer from the Port Authority Engineering Department inspects all timber shoring on a weekly basis. All steps have been taken to insure the design adequacy of the scaffolding being used and the continued integrity of that scaffolding.

During the course of the hearings, Congressman Guarini mentioned that he had received from a constituent a letter written by Louis J. Gambaccini in 1974 relating to the construction of the Journal Square Transportation Center and intimated that the letter raised issues as to the adequacy of the materials used in the construction of the Center. Unfortunately, at the time of the hearing, the precise nature of the inquiry that Mr. Gambaccini was replying to was not made clear. In fact, Mr. Grossinger, the author of the original letter, merely stated therein an observation that the PATH headquarters building would adequately serve its purpose if it were "simple and functional" and any excess money could, he suggested, be used for other purposes. Mr. Gambaccini in his reply never suggested that other than proper material was utilized in the construction, but rather explained that the building was constructed of concrete, an economical and commonly used building material.

A number of questions were raised regarding the applicability of local building codes to projects that are constructed by the Port Authority and PATH. During the course of the testimony, Mr. Tomasetti noted that it was doubtful that the particular problem at the Journal Square Transportation Center would have been discovered by a local building inspector. We feel that it is also worthy to note that during the course of the construction of the Journal Square project, local building officials were kept fully informed of the construction and were provided with a complete set of plans of the facility. At no time were local inspectors denied access to the construction site. During the course of construction, monthly progress meetings were held with local officials.

It has long been the policy of both the Port Authority and PATH to comply with building codes that would be applicable if the Port Authority or PATH were a private corporation undertaking the construction. As an example, the contract between PATH and Blitman Construction Company dealing with the construction of the Transportation Center explicitly provides that:

"In order to effectuate the policy of PATH, the contractor shall comply with all provisions of federal, state, municipal, local and departmental laws, ordinances, rules, regulations and orders which would affect the Contract and the performance thereof and those engaged therein as if said contract were being performed for a private corporation except where stricter requirements were contained in the Specifications or Contract Drawings, in which event the latter requirements shall apply."

The Port Authority is continuing its investigation of this matter while concurrently reviewing its existing engineering and design procedures. At the present time no deficiencies have been noted in the procedures themselves. If upon completion of the final report, however, a need for procedural changes are indicated, we will so advise you.

Pursuant to agreement Mr. Delli Bovi, the Region II Administrator of the Urban Mass Transportation Administration, is presently being provided with monthly progress reports of the conduct of the investigation. I have directed that a copy of this report also be sent to the Counsel to your Committee, Richard Sullivan.

We trust that the above information will be accepted as an addition to the record in these proceedings and will help to clarify some of the facts relating to this unfortunate incident.

Sincerely,

PETER C. GOLDMARK, Jr.,
Executive Director.

The CHAIRMAN. Before we call our next panel, which will involve Federal officials, I would just like to explain how we, the Federal Government, got into this area.

We have the National Safety Transportation Board, which whenever there is an accident involving transportation, is on the scene within a matter of hours, with its experts and with coordination with the Congress.

We had a very severe accident day a little over 1½ years ago, 1 year ago January, I believe it was, that involved the Committee on Public Works and Transportation, and we were able to take action. If you recall at that time there were three major concerns in events that happened in the city of Washington, D.C.

No 1, an Air Florida plane, on taking off from National Airport, crashed into the Potomac River with a great loss of life. It was a terrible accident. At that time, when I heard about it, it was very easy for me to have our professional engineers and staff people immediately take action because the National Transportation Safety Board was immediately on the scene, along with people involved in FAA and CAB. We were able to have an immediate action take place in relation to that.

Second, as you all may remember, just before that plane went into the river, it crashed into what is known as the 14th Street Bridge, which crosses the Potomac. Bridges come under the jurisdiction of this committee. We were able to very quickly have our professional staff people work with the National Transportation Safety Board, and the Army Corps of Engineers, for the needed inspection of that bridge to find out whether it needed major repair before vehicles could go over it.

Twenty minutes later, that same day, we heard of an accident on the Metro subway system in the city of Washington, in which there were three deaths. We were able to coordinate our committee's activities very quickly with that of these agencies of the Federal Government.

When this accident happened on August 8, we gave instructions to our staff to begin to immediately look into it, contacted the Department of Transportation, and found to our surprise that there was no triggering mechanism in this kind of an accident. Apparently when people were in vehicles or would be in vehicles, as a bridge or a plane or a subway system, it was automatic. Where it was merely people themselves with not a vehicle involved, there was not a mechanism for that.

So that following day on August 9, I wrote a letter to the Secretary of Transportation requesting her to immediately create a mechanism for the Federal Government, since we had this much money involved, to be available in Jersey City to be able to coordinate the investigation. I also asked the Secretary to give thought to a formal operating structure so that we would be able in future accidents of this kind, which may have nothing to do with a vehicle at all, to be able to be involved.

I will submit that letter, which was sent on August 9 from me to the Secretary of Transportation, the Honorable Elizabeth Dole, for the record at this point. I received back on August 26, a letter from Mrs. Dole thanking me for the recent letter, agreeing that the Department of Transportation has an obligation to monitor the use of the funds. She said she would have people from the Urban Mass Transportation Administration as departmental representatives sent to Jersey City. They would not necessarily conduct their own investigation, because there was no point in duplicating, but they would observe, and if need be, perhaps participate in the investigation going on at this time. She also pledged her cooperation for whatever administrative action must be taken so that people not in vehicles will get just as much attention and expertise as they do when a vehicle is involved.

Without objection, that letter will be made a part of the record.

[The letter referred to follows:]

THE SECRETARY OF TRANSPORTATION,
Washington, D.C., August 26, 1983.

Hon. JAMES J. HOWARD,
Chairman, Committee on Public Works and Transportation,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: Thank you for your recent letter regarding the collapse of the ceiling at the Journal Square rail center in Jersey City, New Jersey.

I quite agree with you that the Department of Transportation has an obligation to monitor the use of its funds, and I am particularly concerned about the safety implications of this tragic accident. I am therefore dispatching the following Departmental representatives to Jersey City to review the situation: Franz K. Gimmler, Deputy Assistant Administrator for Engineering and Applications, of the Urban Mass Transportation Administration; Lloyd G. Murphy, Director of Safety, UMTA; Alfred Delli Bovi, UMTA Regional Administrator (Region II); and Oscar Orringer, of the Transportation Systems Center.

It is my understanding that a thorough investigation of the accident is underway by the Port Authority of New York and New Jersey, supported by a well-qualified consulting firm, and the DOT representatives will not duplicate their efforts. The DOT staff will, however, become thoroughly familiar during this visit with the status of the investigation and currently available information regarding the accident, and will subsequently continue to monitor the investigation to its completion.

When the investigation is completed, we will consider the findings, including their possible applicability to other DOT-funded structures, and will take whatever action may be appropriate. I believe that the Department has adequate authority to deal with this matter, but I will certainly consider making legislative recommendations if that appears necessary.

Thank you once again for your interest in improved transportation safety.

With best wishes,

Sincerely,

JIM BURNLEY,
Acting Secretary
(For Elizabeth Hanford Dole).

COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION,
Washington, D.C., August 9, 1983.

Hon. ELIZABETH H. DOLE,
Secretary of Transportation,
Washington, D.C.

DEAR MADAME SECRETARY: I am writing concerning the tragic events of August 8 at the Journal Square rail center in Jersey City, New Jersey, in which two people were killed by the collapse of a 50-ton ceiling.

It is my understanding that $60 million in Urban Mass Transportation Administration funds were used for the construction of the Jersey City Plaza. Therefore, it came as quite a surprise to me to learn that no Federal agency has the jurisdiction to pursue an investigation of the August 8 events. It is my belief that we have an obligation to monitor the use of Federal funds in such projects.

Because of the apparent lack of jurisdiction among the various Federal agencies, I am requesting that you create an interagency task force of Department of Transportation officials to investigate this unfortunate accident. The task force should include representatives of the National Transportation Safety Board, the Urban Mass Transportation Administration and the Transportation Systems Center.

I hope you will be able to take action quickly on this matter because of the questions surrounding a structure that has been in place for less than a decade.

In addition, I believe it may be necessary to amend the law to ensure that one Federal agency has clear jurisdiction over such a situation. For future events, the law should be clarified and I would appreciate any suggestions you may have in this regard.

Finally, this Committee would like any information the Department of Transportation may have regarding the construction of similar Federally funded structures elsewhere in the country. I hope this is an isolated instance but we should have the information to ensure that it is.

I know you are as concerned as I am about the circumstances that could lead to the events of August 8. I hope we can work together to determine the cause and prevent any repetition. We will be pleased to receive any assistance you can provide.

Every best wish.

Sincerely,

JAMES J. HOWARD, *Chairman.*

The CHAIRMAN. Our next group of witnesses are: Mr. Martin Convisser, Director of the Office of Industry Policy of the U.S. Department of Transportation; Mr. Alfred Delli Bovi, the regional administrator for region II for the Urban Mass Transportation Administration; Mr. Franz K. Gimmler, Deputy Assistant Administrator for Engineering and Applications of the Urban Mass Transportation Administration ; and Mr. Lloyd G. Murphy, Chief, Office of Safety and Security, Urban Mass Transportation Administration.

TESTIMONY OF MARTIN CONVISSER, DIRECTOR, OFFICE OF INDUSTRY POLICY, U.S. DEPARTMENT OF TRANSPORTATION, ACCOMPANIED BY ALFRED DELLI BOVI, REGIONAL ADMINISTRATOR FOR REGION II, URBAN MASS TRANSPORTATION ADMINISTRATION; FRANZ K. GIMMLER, DEPUTY ASSISTANT ADMINISTRATOR FOR ENGINEERING AND APPLICATIONS, URBAN MASS TRANSPORTATION ADMINISTRATION; AND LLOYD G. MURPHY, CHIEF, OFFICE OF SAFETY AND SECURITY, URBAN MASS TRANSPORTATION ADMINISTRATION

The CHAIRMAN. We are happy to have you here this morning and suppose we begin with Mr. Convisser.

Mr. CONVISSER. Good morning, Mr. Chairman, and members of the committee. I am Martin Convisser, the Director of the Office of Industry Policy of the Department of Transportation. I am pleased to have the opportunity to address the committee today with respect to the Journal Square accident investigation.

I am accompanied this morning by Mr. Alfred Delli Bovi, the Urban Mass Transportation Administration regional administrator for region II, which encompasses New Jersey. Also with me are Franz K. Gimmler, the Deputy Assistant Administrator of UMTA for Engineering and Applications, and Mr. Lloyd G. Murphy, Chief of the UMTA Office of Safety and Security.

Mr. Chairman, Secretary of Transportation Elizabeth Hanford Dole places an extremely high priority on safety in all modes of transportation. Since becoming Secretary, she has undertaken numerous efforts to improve transportation safety. As only one example, as this committee is aware, she recently submitted legislation to consolidate much of the Department's surface transportation safety responsibilities within a national traffic safety administration, to assist the Department in improving and coordinating our highway safety programs.

Because of this commitment to safety, Secretary Dole has been particularly concerned about the serious and unfortunate incident that occurred in this Journal Square complex on the morning of August 8, resulting in the death of two people and the injury of eight others. We believe that the use of UMTA grant assistance in the construction of the Journal Square Terminal requires us to carefully follow this situation. To this end, shortly after the tragic accident, Secretary Dole requested that the three gentlemen who accompany me this morning, and Oscar Orringer, an engineer at the Department's Transportation Systems Center in Cambridge, Mass., represent her in meeting immediately with the port authority. She directed them to become thoroughly familiar with the status of the investigation, and the information then available about the accident. She further directed them to continue to monitor the investigation to its completion.

The August 8 tragedy has caused the Department to review UMTA's statutory authority in the area of mass transit safety. Our review has led us to affirm the Secretary's initial view, stated in her letter of August 26, that UMTA's statutory authority is adequate to permit UMTA to discharge its safety responsibilities in this matter.

As a grantmaking agency, UMTA generally has the authority to set terms and conditions for its grantees in the area of safety. In addition, the recently enacted Surface Transportation Assistance Act of 1982 included a provision, section 22 of the Urban Mass Transportation Act, which sets forth the Secretary's specific authority to investigate unsafe conditions in transit facilities, equipment, and operation. We believe that section 22 and UMTA's general grantmaking authority are sufficient, and at present we do not seek legislation to increase UMTA's authority with respect to incidents such as this.

Mr. Chairman, I assure you and the committee that in the interest of improved transportation safety and the prudent use of the Department's grant funds, the Department will pursue the investigation of the Journal Square incident to its completion.

I would now like to turn to Mr. Delli Bovi, who will discuss UMTA's role in this project, its general procedures, and its involvement since the August 8 accident. We will both remain available to answer any questions you may have after Mr. Delli Bovi delivers his statement.

Thank you.

Mr. DELLI BOVI. Good morning, Mr. Chairman and members of the Committee. As Mr. Convisser indicated, my name is Alfred Delli Bovi and I am the UMTA regional administrator for region II, which covers primarily the States of New York and New Jersey.

On August 30, 1983, Franz Gimmler, Lloyd Murphy, Oscar Orringer, and I, conducted a field investigation and represented the Department of Transportation at a meeting in this complex with officials of the Port Authority of New York and New Jersey and its subsidiary, the Port Authority Trans Hudson (PATH) Corp. to discuss the port authority's investigation into the August 8 ceiling collapse.

During our meeting we specifically focused on the scope and depth of this investigation. At that time, the port authority assured us that the investigation would include interviews with more than 50 persons associated with various phases of construction, maintenance, and operation of the Journal Square Transportation Center as well as examinations of the design, construction, and maintenance history of Journal Square, inspections and reports related to the structure, and inspections and testing related to the structural integrity of the terminal. The port authority also indicated at the meeting that they had retained the services of Lev Zetlin Associates to conduct an independent investigation of the affected area. Lev Zetlin Associates is the engineering consultant firm that participated in the investigations of the Hartford Coliseum ceiling collapse and the Hyatt Hotel skywalk collapse in Kansas City.

In light of the comprehensive nature of this investigation, we concluded that no separate investigation by UMTA was warranted at that time and that any such investigation would be duplicative. We have continued to monitor the port authority's investigation as Secretary Dole informed you we would. We continue to be satisfied with the conduct of that investigation. We will continue to follow it closely and to review the report upon its completion. We will take any action that might be appropriate, after that review. In the meantime, we remain available to provide the port authority with any technical assistance which it may require.

I might add that the port authority staff has kept us continuously informed throughout this investigation and provided us with a steady flow of information.

Because of UMTA's financial investment in the Journal Square Transportation Center, we are greatly concerned with the outcome of the port authority's investigation. We want to find out exactly what happened so that we might assure the structural integrity of any similarly designed facility elsewhere in the country by, at least, providing the results of the investigation of our grantees.

The port authority received approximately $39,066,750 from UMTA with the stipulation that the port authority, as recipient of these funds, would commence, carry on, and complete the project in a sound, economical and efficient manner.

It has been the general practice of the recipients of UMTA funds in their roles as owner of the project facilities to manage construction projects throughout all phases of construction and during operation. A typical grantee will hire or contract for the services of engineers, architects, and other professionals who have been licensed in their fields by professional State and national associations to perform the duties necessary to the sound construction of transportation facilities.

In its capital projects, UMTA primarily relies on these licensed professionals employed by the grantee. The costs of such services are customarily paid for by UMTA under the project grant. In addition, most grantees must comply with multiple levels of building codes. In the case of a typical grant project, the grantee must comply with national building standards, a State building code, and local codes. Although the port authority, due to its status as an interstate compact agency, is exempted from most building codes, the authority has, as a practice, complied with the codes generally applicable in its geographic area. In Jersey City, the Building Officials Conference Code [BOCA Code] has been in use since the late 1960's. UMTA proceeds with the expectation that these safeguards assure adequate protection for UMTA-assisted projects.

In short, we are extremely concerned about the safety issues in construction projects. We believe that our practice of relying on State and local building code compliance procedures has been an effective and adequate means of ensuring sound construction. This is supported by the fact that, during the life of the section 3 capital discretionary grant program, we have awarded approximately $16.4 billion in assistance. The vast majority of these funds has been used for construction, and the projects have had a very good safety record.

Nevertheless, we will continue to follow the Journal Square investigation closely. We will take appropriate action, if warranted, after reviewing the port authority's final investigation report. If we conclude that we need any additional statutory authority, we will advise the committee of that need.

Thank you very much.

[At this point, Mr. Roe assumed the Chair.]

Mr. Roe. The gentleman from New Jersey.

Mr. Guarini. Thank you, Mr. Chairman. I think that part of the import of your statement is that, and it has been mentioned here, what we are talking about today has very wide application. We are talking about a specific incident which is a symbol of perhaps other problems that might exist throughout the country, so that there is a nationwide implication.

When the port authority received $39 million in UMTA funds was there input by the Federal Government, through any of its agencies, in the design and supervision of construction of this facility?

Mr. Delli Bovi. When a grantee obtains a grant, UMTA first finds as part of its grantmaking process that the grantee is capable. We then monitor the process, but we do not specifically approve plans and specifications for the projects in a typical situation.

Mr. Guarini. In other words, you just grant the money, but they do not have to provide plans, specifications, and design which you approve?

Mr. Delli Bovi. They may provide plans and specifications. We may request it in certain instances. And we may review those plans and specifications. But generally we are paying for a construction manager, a construction coordinator, if you will, who is responsible for the technical review of the plans.

Mr. Guarini. So that there is accountability: you just give responsibility to the project manager, for the port authority in this instance, and just hope that they, through their engineers, will spend the $39 million appropriately and insure safe construction in a satisfactory manner, is that correct?

Mr. Delli Bovi. We monitor their progress. Periodic reports are submitted generally on a quarterly basis. As construction commences they are reviewed by our staff, but we have in general found--we do as a general practice in making a grant first find that the grantee is capable.

Mr. Guarini. I understand that and I am sure that that is so. Now, do you have people assigned to the construction project? Do they come on the scene and supervise or have input into the project? Or do you just get reports that you review in your Washington office or your regional office?

Mr. Delli Bovi. We may dispatch from time to time engineers to the scene but we are not the construction managers on the project. We are not there on a regular supervisory basis. We provide construction manager oversight. We do not provide construction management services.

Mr. Guarini. So therefore your input into the project is rather minimal as far as design plans and specifications are concerned. And that you sometimes will come and look at the project, but not necessarily as a matter of policy, is that a fair statement?

Mr. Delli Bovi. I would say it would be fair to say that we will always visit the site during the construction. We will make a final inspection before closeout of the grant. But our review is designed, is aimed at establishing that the money was used for a transportation purpose, that it was within the scope of the grant. And we generally do not get into the areas of detail, which have been the subject of discussion here this morning.

Mr. Guarini. Well, do you see it as UMTA's obligation to insure that the public moneys are expended properly and efficiently and that a safe facility is built for the public, or do you leave that to the port authority?

Mr. Delli Bovi. We recognize that as an obligation and we monitor to that. However, we would not, as a general matter of course, review the specifications with regard to the weight that would be held by the tabs, for instance, in this particular case. That level of detail we would not get to. There are licensed architects and engineers. We are paying for their services. And we would expect that they are going to do their job.

Mr. Guarini. Do you audit the expenditures of the public funds?

Mr. Delli Bovi. Yes, we do. Not only by UMTA, but since the creation of the Office of Inspector General in 1978, I believe, that is done independently within DOT by our Inspector General.

Mr. Guarini. Do you audit the contracts and subcontracts of the donor, in this case the port authority?

Mr. Delli Bovi. They would be available and within the subject of our audit. I would like perhaps, if you would allow us to answer that question for the record, because I would like to confer with the Inspector General to find out exactly the scope of their audit, but it is my understanding they can go to the subcontractors if they so desire.

Mr. Guarini. All right. Perhaps you can submit your answer to that. Is there an audit for the $39 million and can we have a copy of the audit to see how this money was spent?

Mr. Delli Bovi. We can give you the final closeout report on the project and we will supply that to you, yes.

Mr. Guarini. Would there be anything in the audit concerning the construction details, such as the ceiling in question, or is it just a general audit?

Mr. Delli Bovi. I have not read this specific audit, but generally it is a financial audit.

Mr. Guarini. You will submit a copy of the audit?

Mr. Delli Bovi. We will.

Mr. Guarini. Who is responsible, in your opinion, for the safety of the traveling public going through airports, and taking railroads, and trains, and things of that nature? Is it the Federal Government that has the responsibility to oversee this?

Mr. Delli Bovi. Congressman, I would say that the operator of a facility is responsible for its safety.

Mr. Guarini. All right. So in this case the port authority is the sole entity responsible for the safety of the traveling public, is that correct?

Mr. Delli Bovi. Yes, I would say so.

Mr. Guarini. Should the Federal Government have any input as a check and balance on the port authority's actions? You see where I am going.

Mr. Delli Bovi. Yes; the Federal Government, under the Surface Transportation Assistance Act of 1982, has the right under section 22, which is a new section that was added to the UMTA Act, has the right to conduct a safety inspection on any facility for which we have provided Federal financial assistance.

Mr. Guarini. Have you ever requested in the Journal Square complex the right to come in and to inspect, for the safety of the public, the building facilities here at Journal Square?

Mr. Delli Bovi. We requested access to the facility immediately after the accident. It was granted. It is my understanding that upon completion of construction a field inspection was also conducted at that time. In both cases the port authority has been cooperative in providing us with with access.

Mr. Guarini. Mr. Delli Bovi, would you state that if public funds are used the Government should unequivocally have the right to come in and to supervise the design, and the plans, and specifications? And should they have the right to come in and inquire into the nature of the construction and see that the construction of the facility is properly carried out? And should the Government have the right to periodically thereafter safeguard the public by having the right to certify that the building is indeed a safe building? For instance, every 5 years. What is your opinion about this, sir?

Mr. Delli Bovi. In the construction phases, I believe we now have the authority to request the information that you describe, to review specifications, to review materials and to review the work in progress. I am not certain that we have the authority after construction to continue periodic building-type inspections, other than that authority which was granted to us by section 22 of the Surface Transportation Assistance Act of 1982.

Mr. Guarini. In your experience and in your opinion, should the Federal Government have a right to follow its moneys to see that the money is being properly spent and that the safety of the public is protected?

Mr. Delli Bovi. I certainly believe that as stewards of the Federal funds, we should have the right to review how the money will be spent before it is expended and has been spent after it has been expended. And I have found that generally we have been given that right under the existing statutory authority. Our grantees generally are very accommodating to us, because in most cases they have another application pending in the future and they intend to be coming back to the same well. So we find them very cooperative usually.

Mr. Guarini. Do you inspect the tracks and the equipment in the case of the port authority facility here periodically?

Mr. Delli Bovi. We have never made a grant to the port authority for the railroad itself.

Mr. Guarini. Assuming that you do not make a grant, do you have any jurisdiction, or is there any Federal jurisdiction that could come in and inspect and examine the tracks, switching equipment, and the cars?

Mr. Delli Bovi. The Urban Mass Transportation Administration does not have that type of jurisdiction. The National Transportation Safety Board would in the event of an accident.

Mr. Guarini. Only in the event of an accident. But would they have the right to come in for a periodic inspection if they were so requested?

Mr. Convisser. Mr. Guarini, I think, if I am not mistaken, the Federal Railroad Administration in the Department of Transportation has responsibility, safety oversight with respect to the operation of rail facilities. I can verify that for the record, if you would like.

Mr. Guarini. You have the right to come into the port authority building and make an inspection and certify the safety of it under the existing laws today, sir?

Mr. Delli Bovi. I am not sure I understood. Which building do you mean?

Mr. Guarini. The building in question where we had the fallen ceiling.

Mr. Delli Bovi. We have the right to inspect buildings for which we have paid for the construction. And the Journal Square is one of those buildings. I might add it is the only building in the whole port authority real estate portfolio that we have paid anything for.

Mr. Guarini. So that you have no way of going into the World Trade Center to certify the safety of that building or any other transportation center that the port authority is responsible for in order to protect the public? It is up to the port authority alone in their grand wisdom to protect the public that is traveling?

Mr. DELLI BOVI. I would venture to say, we do not have the authority as the Urban Mass Transportation Administration. I would venture to say that various local building and safety inspectors in the appropriate jurisdictions would have responsibilities for say the Port Authority World Trade Center.

Mr. GUARINI. Earlier this morning, testimony indicated that the port authority cooperates with local inspectors but do not allow them the authority to inspect. So the port authority becomes a 51st State in the way that they have their own sovereignty. What I am asking is should we exercise tighter controls over the port authority in order to make sure that the public is safe?

Mr. CONVISSER. If I can respond to that, sir. If the States of New Jersey and New York and the local authorities do not have authority to inspect those port authority facilities, it is because they have granted an exemption in one form or another to the port authority. The States have the basic authority. The port authority is a creature of those States.

Mr. GUARINI. I am not sure whether or not your answer is the answer that I would agree with. We may take opposite sides on that because I think the accountability of the port authority is very limited. The Governors of both States routinely approve the minutes of the port authority. Other than that, they are absolutely above the law in every regard because there is a treaty between two States that allow the port authority its independence.

Mr. DELLI BOVI. That was my point; that the States voluntarily agreed to that arrangement by making that treaty.

Mr. GUARINI. So do you feel that we should certify and inspect these buildings every 5 years or every 3 years to make sure that the public is safeguarded in these buildings? Millions of people every year use all their facilities. Should there be Government Federal supervision over the port authority or a crosscheck on them to make sure that the public is protected?

Mr. DELLI BOVI. I am not prepared to answer that question at this time, Congressman. I would like to ask first if you could frame it a little bit more closely so that I could ask our Washington headquarters to cooperate with us in responding.

The difficulty that I have in answering the question now is that there are a number of factors that contribute to the safety or the hazards in a condition. And some of these transcend the area of transportation. And I am not certain we can answer that question as the Department of Transportation responding. The safety problems can transcend the transportation aspects of the various facilities that make up the port authority's facilities.

Mr. GUARINI. From your experience, if there was a requirement by Congress for a periodic inspection of the safety of the buildings, would it be the General Services Administration that has their inspection teams, or do you think it should be the Department of Transportation? If you have an opinion on that.

Mr. DELLI BOVI. I would not venture an opinion on that. I would have to see the scope of the proposal.

Mr. GUARINI. Have you done any examination independently on the cause of the accident, or are you relying upon the consultant engineers that just testified earlier?

Mr. DELLI BOVI. We are at this point relying upon the information provided by the port authority's own investigation team, by the consultants that they have hired. We have brought in a consultant of our own from TSC to review the investigation methodology. We will be reviewing both the interim report and the final report in great detail and at that point we will make a determination of whether any further or independent information or investigation is required by the Department of Transportation.

Mr. GUARINI. Will the gentleman for the record identify the TSC?

Mr. DELLI BOVI. The Transportation Systems Center in Cambridge, Mass., which is associated with the Department. Mr. Oscar Orringer was the engineer who visited the site and inspected the site with our review team on August 30.

Mr. GUARINI. From your knowledge, and of course your part of the inspection, Mr. Delli Bovi, were nationally accepted building regulations and practices followed in the construction of this ceiling?

Mr. ROE. If the gentleman would yield, I do not believe that there is anything referred to as a national policy or a national inspection facility of that nature. You would not have jurisdiction there.

Mr. GUARINI. No; but I mean from your experience were the building practices which are accepted as a national standard used? If you have an opinion. If you do not, I understand.

Mr. DELLI BOVI. The BOCA code which is the one in use in Jersey City, and which the building——

Mr. ROE. Identify the BOCA code, the uniform building code.

Mr. DELLI BOVI. The building officials conference code, commonly referred to as the BOCA code, has been in use in Jersey City since the late 1960's. It is my understanding that the port authority complied with code in this facility and that is one of the standard acceptable codes in the industry.

Mr. GUARINI. Should the port authority, in your experience, be willing to submit to the laws and inspections of the local and State authorities?

Mr. DELLI BOVI. It is my understanding that the port authority does comply with whatever codes are in vogue in the particular jurisdiction where they are building.

Mr. GUARINI. Should they be required to submit to the local and State authorities, not that they do it voluntarily, but should they be required as a matter of law? If you have an opinion. I do not mean to embarrass you at all. I just want to get from you your expertise, sir.

Mr. DELLI BOVI. I believe that kind of a mandate would best come from the State legislatures to whom the port authority is accountable.

Mr. GUARINI. But would it be helpful to the Federal Government in their quest for protecting the safety of the public to take a position that local and State regulations should be complied with by the port authority?

Mr. Delli Bovi. I do not believe that would be helpful.

Mr. Guarini. So you take a position that the local and State authorities should have no input into a facility which is placed in the public domain, where the public makes constant use of it every day? Is that the position of the Federal Government, sir?

Mr. Delli Bovi. The position, sir, is that the port authority is a creature of the State and local governments. And I believe that the port authority should be held accountable to that level of government which created it.

Mr. Guarini. But are they accountable? Are they accountable to you?

Mr. Delli Bovi. In the area for which we have provided financial assistance, they have been accountable.

Mr. Roe. If the gentleman would yield, I do not believe you are in a position to make a policy statement for the Department of Transportation, No. 1.

No. 2, in Mrs. Dole's letter to the chairman, and I quote, she mentions in her third paragraph, "It is my understanding that a thorough investigation of the accident is underway by the port authority, supported by well-qualified consulting engineers and firms," and most importantly, and that is added, "and the DOT representatives will not duplicate their efforts."

So from a policy point of view, as far as that particular review is concerned, she says that is being followed. So I think what the gentleman from New Jersey is asking really should be put into writing to submit to the Transportation Department because that is a matter of national policy.

Mr. Guarini. How much time would you expect that it should take, in your experience, to complete the finalization of the report of the port authority? Now, they have been 90 days already examining this one incident that took only a fraction of a second. How long do you think would be a reasonable length of time, in your experience, to have a final report in our hands, sir? You are part of the task force, and you can apply pressures to see that this report is released at the earliest possible date for proper recommendations to be made or legislation, if any.

Mr. Delli Bovi. I would expect to have a final report when all who are involved in the report are certain that they can have a report that was done right. The interim report raised a series of questions that have yet to be answered. Some of those questions, particularly in the area of roles and responsibilities, are going to be very difficult in my experience to get answers to. There is going to have to be a great deal of interviewing, a great deal of crosschecking, and I am less concerned with how quickly the report is produced than with the fact that we get a report that shows that the investigation was done right, and that points to remedies that can be put into place to make sure that this kind of accident does not happen again anywhere in this country. It is more important that we get a report that is done right, than we get a report that is done——

Mr. Guarini. We want to make sure that there is no whitewashing of responsibilities. That we have a complete, open report.

In your experience, how long does it normally take to make a report, a final report? This is no different accident than many other accidents that have taken place. How long should a report take? We have been at it 90 days. How long would you expect that as a professional to get a final report? What is the average time, in your experience, for a report to come in concerning an accident?

Mr. Delli Bovi. I have not had any experience, fortunately, with a ceiling collapse of this nature or any other kind of structural problem in this region that is like this. And I would not be able to make a guess at this time.

Mr. Guarini. Mr. Delli Bovi, in all due respect, and as a matter of Government which we all are part of, I think I can frankly say that we have met the enemy and they are us. No further questions.

Mr. Roe. I want to thank you for your testimony. I think you have been forthright and objective in your responsibility, all three of you. Let me ask the following questions though. And I just want to reiterate.

You mentioned in your comments that you were satisfied and have been monitoring and coordinating with the port authority as far as the quality, if you like, of the investigations that are going on. There is a time element involved. What concerns this member basically is the testimony from port authority that they are moving in two succinct directions with an early response. And that I think is the critical response at the moment.

One has to do with the safety of the structure, per se, and the second has to do with the methodology that will be followed to replace those ceilings, or restrengthen them, one or the other.

So you are satisfied that that is on schedule. They talked about having that done sometime in December or January.

Mr. Delli Bovi. Yes; and every indication that they have given us is that they are moving as rapidly as possible.

Mr. Roe. You have no reason to doubt them?

Mr. Delli Bovi. We have no reason to doubt them.

Mr. Roe. Let me ask a second question. It seems to me me that the gentleman from New Jersey, Mr. Guarini, is leading to some significant points as it relates to national legislative policy, and therefore translated into administrative policy.

It would seem to me it would be helpful, and I do not know if you thought about this or not, maybe Mr. Convisser can answer that. I would think we have looked through what happened here in this port authority situation, vis-a-vis two other buildings, which it has been right on top of. Would it not be a good idea to have the Secretary send out a notification to the different agencies we work with, other port authorities and so forth, to take a look and be sure that they are not caught in the same kind of design situation.

I do not know whether these ceilings have been used in any other place. And it seems to me they probably have been, because obviously it takes time for somebody to put that methodology together. I would think it would be helpful, and one thing to come out of this meeting today, is that that there ought to be a national notification sent out on any ceilings of structure that we are aware of now throughout the Nation which would be a responsibility, vis-a-vis the point of your funding those agencies, at least in part or whole, whatever the case may be.

Mr. Convisser. That is quite possible. As you know, the interim report has just been released and we will be looking at that.

Mr. Roe. Would you make it a point to do that? I think that that is an important thing so we have started another chain going nationally, saying if there are any places throughout this Nation where these types of ceilings are being used, that they ought to be looked into. And it might be well we do that with some of the construction organizations, design organizations throughout the country. I think it ought to be publicized so people are aware of it, so we do not have a recurrence while this thing is being investigated.

I believe, as was testified to by Mr. Delli Bovi, that you do have considerable authority under the new section of that 1982 law which has yet to be totally implemented, I would assume.

I do not have any further questions. Are there any further questions?

Mr. Guarini. Just one last question. Inasmuch as you have been part of the task force and have looked into the happening of this particular incident, do you have any recommendations or suggestions for legislation to the committee to prevent a reoccurrence of this type of accident? In other words, is there any positive recommendation that you have so that this tragedy would not be repeated?

Mr. Delli Bovi. When the final report, which deals with the roles and responsibilities is in, we will be able to make a recommendation. As I said in my statement, if a definitive recommendation is warranted, we will make one at that time. Congressman Roe pointed out earlier the five W's, and when I taught journalism in the high school level, we used to say all of that led to the question or answered the question "How?" When we know through the investigation of the roles and responsibilities how this happened, we should be in an informed position to talk about remedial action to make sure that it does not happen again.

Mr. Guarini. Do we expect that you would push the port authority to give a finalization report at the earliest possible date? And I mean in the matter of a few months, not a matter of 4 years, as was suggested could be an outside date, in the earlier testimony, which I was outraged by.

Mr. Delli Bovi. You may be sure, Congressman, that we will continue to push them to do the report and to do it right. My own view, based on the resources that they have committed to this job, is that we will certainly have a final report a lot sooner than 4 years.

Mr. Roe. Let me suggest this point to you now. The investigator oversight committee on public works also has a responsibility, and what I would like you to look into is is there any additional resources that are necessary? In other words, is there anything that we should be doing at the Federal level to beef up the activities and strengthen the activities of the port authority. And I think we ought to have that in the record.

And I think what the gentleman, again, from New Jersey is leading up to, maybe my ears are not that big, but I did not get that 4-year period. I do not see that. Because we have had catastrophic accidents. I am thinking about the one Mr. Howard mentioned alone, that crash in the Potomac, and that certainly did not take 4 years, and I did not understand that to come from port authority.

We would like to take a look. And I think you might owe that to this committee from your review, being members of that task force, what do we see to be a reasonable time. I am looking at the timeframe being a liability. I understand what that issue is from a liability point of view, but I think in order for us to recommend any legislative action, that the substance of the report we need as rapidly as we can get it. I mean from a purely pragmatic point of view, and I do not say this with any unkindness, we are not as much concerned, I am not, this member is not as much concerned where they nail the liability to.

The question is, how do we short circuit the situation or get a reasonable timeframe so that any policies we have to put into focus can be put into focus from this safety point of view. I see lawyers, forgive me, and engineers think differently, as the liability is an important part, and there is no question about that, who is really going to pay the bill is what it amounts to, but that is after the damage is done.

I would like to see two things assured: one is the immediate safety aspect we are speaking to, which is without rehashing it. We have been through that. And the second point is, when do we get the technical facts so that we can determine whether there should be changes in the law that would safeguard these kinds of accidents happening again.

I think the third element of that report is how do you nail down liability, the steps in between. We might be able to get from yourselves, and with your help, and with the port authority's help, admit a second response as far as the technical engineering aspects are concerned, which lead to the change in the law. Do you see what I am trying to get at? That is what we are interested in.

Mr. DELLI BOVI. Yes.

Mr. ROE. Any further questions?

Mr. GUARINI. Would it be reasonable, as Secretary Elizabeth Dole's Department of Transportation task force, to ask for weekly or monthly progress reports to make sure that you are satisfied that it is being monitored and being taken care of in the most expeditious manner?

Mr. DELLI BOVI. We will continue to meet with the port authority officials to get regular progress reports, and if you would like, we will certainly keep you informed of this. And let me assure you that I will also attempt to find out from the port authority their overall timetable to the extent possible. But let us emphasize the need to do the job right and it is harder to say just how long that will be.

Mr. ROE. But there is a saying that goes: "The operation was a success, but the patient died." What this committee is trying to nail down, without going beyond this statement, is that there is every reason to believe that we know there is a deficiency. That has been testified to. My concern as a citizen, not a Member of the Congress, is that we notify the people throughout this country that if this kind of design ceiling has been used in a public building, and there are thousands of them, that we ought to put them on alert immediately. To spend our time and debate the structure or the failure of a structure which we know is a deficiency, and which the port authority has testified to, is fine. The issue is is it safe, what do we do to make it safe, and how quickly can we do that?

It may take a year to nail down. Maybe the witness might have, God forbid, a heart attack or something of that nature. Well, that is not the issue. The issue is the structural failure is the concern of this committee, and do we take remedial action in law, or is the law sufficient to be able to follow that. Do we strengthen inspections? What do we do?

So I think what we are trying to nail down is that technical response and not get hung up on the point of view of the liability aspect, if you understand what I am trying to say.

Mr. **Delli Bovi**. Yes, sir.

Mr. **Guarini**. Last, then, Mr. Delli Bovi, and your task force, will you ask for weekly and monthly progress reports and submit them to the committee as you get them?

Mr. **Roe**. Why don't you do this. You need a chance to consult the port authority and your Washington office. Why do you not come back to us say, in not less than 1 month, we would like a monthly report from the Transportation Department as to their observations to the committee.

Mr. **Guarini**. As to their observations and as to their findings and as to the progress that they have been making, so that we know exactly.

I get weekly reports from my congressional office, from every member of my staff, and it should not be very difficult for the port authority with the thousand employees that they have and the people that are involved, to make regular weekly reports. But even if it is a monthly report, I would like as a member of the public, to know exactly what the port authority is doing from day to day, and week to week, and month to month so that we can come to an early conclusion.

Mr. **Delli Bovi**. We will request monthly reports and make them available.

Mr. **Guarini**. Consider weekly reports also, because we would be a little more specific. And a monthly report might be a little too general, and that is why I would ask you to consider it. It is your task force. It is your duty as you see your own procedures.

Mr. **Delli Bovi**. We will take it under consideration and speak with the port authority people about the possibility of doing it.

Mr. **Guarini**. Just so that we do not have to have hearings again very soon. Thank you very much.

Mr. **Roe**. Thank you very much, gentlemen, for your testimony. It has been very helpful to us. We appreciate your efforts.

Our final witness for today is Mr. William Connolly, who is the director of the division of housing and development, New Jersey Department of Community Affairs.

I want to welcome you, Mr. Connolly, to our committee. Do you have formal testimony?

TESTIMONY OF WILLIAM CONNOLLY, DIRECTOR, DIVISION OF HOUSING AND DEVELOPMENT, NEW JERSEY DEPARTMENT OF COMMUNITY AFFAIRS

Mr. CONNOLLY. No. I was asked to comment on this tragedy as it applies to our state's building code system, and that will be the limit of my testimony.

Mr. ROE. You may proceed.

Mr. CONNOLLY. I am the director of the New Jersey Division of Housing and Development. That division is responsible for building standards in New Jersey and our State building code system.

The building we are sitting in is one of the very few in this State that I am not responsible for. New Jersey has an organized from the top down, comprehensive system of building code enforcement and has had one since the beginning of 1977. We have a preemptive uniform construction code, which is the only code that governs construction in the State. There are no local codes in New Jersey. We have one State code that is enforced in every jurisdiction.

Enforcement of the code is on a joint basis by the State, our department, and municipalities. Just who does what is based upon the complexity of the project and the competence of the local agency. But we have only one level of government responsible for one activity. It will vary from town to town and building to building, as I say, depending upon the complexity of the building and the competence of the local officials.

We know the competence of the local officials because they are all licensed by the State of New Jersey through a program of education and testing. And they are licensed at various levels corresponding to various complexity and types of construction.

We have plan review for compliance with the code before construction starts and we have periodic required inspections throughout the construction process. To insure that there is conformity with the code, those inspections are carried out by an independent government agency in each case.

The code that we use is not written by the State of New Jersey. New Jersey uses what is called a model building code. We adopt it by reference. A model building code, and there are three in this country, is something that is assembled and published by a national nonprofit organization of concerned governmental officials. These model building codes are developed through an extensive committee and hearing system designed to insure the broadest possible base of informed technical judgment goes into the code.

One of the three that we use in New Jersey is the basic building code. It is published by the building officials and code administrators international, and it is commonly referred to as the BOCA Code. It is a state-of-the-art performance-based code.

Its requirements, particularly structural ones, are stated in terms of the expected performance. That performance is analyzed and validated in accordance with engineering design standards, material and test standards, and calculations to insure conformity with each.

On the installation side, the State code requires the appointment in each job of a responsible person in charge of work. That is a person between the architect and the contractor who insures that things such as shop drawings and and coordination occur.

The Port Authority of New York and New Jersey is subject to the Uniform Construction Code, but in a limited way. And let me just read to you directly from the State statute. It is only two sentences. This is from the New Jersey Uniform Construction Code Act:

> Construction, alteration, renovation, rehabilitation, repair, removal or demolition of any building or structure situated wholly within New Jersey by or for an agency created by Interstate Compact, to which New Jersey is a party, shall be subject to provisions of the code, provided that such Interstate agency shall have exclusive authority to administer and enforce the code with regard to such buildings and structures.

I would like to comment for a moment on how we see this situation from the State level and comment also briefly as to our opinion relative to the Federal Government possible Federal role in these sorts of situations.

What we have here is a very ordinary sort of a failure. This is not high technology. This is not high technology engineering. It is a simple human error. The condition that was described to you this morning is a violation of the Uniform Construction Code. Someone who was doing the work simply did not take care to insure that he was complying.

So the problem, as we perceive it, is not one of building standards. In fact, both your earlier statements, Mr. Chairman, that there are no national building standards is correct. There certainly are nationally recognized or accepted building standards, and the model code that we use is one of them. The problem is in the application of that code and a specific situation. And in that context, we do not have a unique situation here.

In my experience, it is typical for these kinds of facilities, contructed by authorities, are to be exempt to a greater or a lesser degree from provisions of State and local codes. Wherever it is that they manufacture the boilerplate for authority legislation, whether it be a housing authority, a turnpike authority, a port authority, an airport authority, it almost always contains a provision where it says the authority will not be subject to State and local building codes.

For the Federal Government that finances many of its projects of this nature through authorities of that kind, that is something that might be of concern and might need to be remedied in some way, even from a Federal perspective.

In general, though, we believe that building standards are State and local responsibility. We believe that the State governments and the local governments in general terms should be responsible and should be held accountable for this sort of a situation. In New Jersey there are not any other authorities that are independent of the code. When the Uniform Construction Code Act was passed, all the preexisting exemptions from codes that were enjoyed by many authorities were swept away. The Port Authority is the only one that remains.

And, as I say, that is a somewhat limited one in that they are required to comply with the code. They simply are not subject to the enforcement procedures which come out of the State and local governments.

Certainly the Federal Government ought to want to consider mandating the use of model building codes, or compliance with model building codes for structures of this kind. I do not think it is necessary for the Federal Government to undertake to write its own standards. These nationally accepted standards that are already widely available, are at least in my judgment adequate.

The Federal Government, taking note of the fact that authorities such as the port authority, commonly have an exemption from local enforcement procedures, might want to consider mandating some sort of independent inspection procedures. Most desirably, I think that should be through the State or local government, who I believe have that obligation in the first instance. But if that is not possible or feasible, and it certainly is not possible or feasible everywhere in this country, then the Federal Government may want to consider that kind of a requirement.

I think all of these Federal requirements ought to be made applicable wherever there is an absence of adequate State and local requirements. Thank you very much.

Mr. ROE. Mr. Guarini?

Mr. GUARINI. That is an excellent statement, Mr. Connolly. Let me ask you, the health and safety of the public is normally left in every instance to the local and State authorities. And you say that the exemptions that exist, exist only for the port authority. There is no other authority that has the status that the port authority has in being able to enforce its own codes and police itself. Is this unique to the port authority in our State of New Jersey that they are the only body that is left above the law?

Mr. CONNOLLY. In New Jersey it is unique, yes.

Mr. ROE. If the gentleman would yield. But you said they are subject to the code.

Mr. CONNOLLY. They are subject to the code.

Mr. GUARINI. But they enforce the code, as I understand what you said, which means that there is no way for us to implement it except to just take their word that it is being enforced by them.

Mr. CONNOLLY. For instance, if this building had been constructed by the turnpike authority, it would be subject to independent inspections outside of the turnpike authority for conformity.

Mr. ROE. I think what I want you to do is clarify the record, because I think it is important, so that we understand precisely. You say that, and you read the statute, the port authority is subject to the code. Why do you not explain for the record what you mean by subject to the code?

Mr. CONNOLLY. They are required to insure, they are required on their own to insure that anything they construct conforms to the code of the State of New Jersey.

Mr. GUARINI. That is like putting a fox in a chicken coop, more or less.

Mr. ROE. Do they give you a certification to that effect?

Mr. CONNOLLY. No, they are not required to give any certifications to anyone.

Mr. ROE. So it is just implicit in the law?

Mr. CONNOLLY. Yes.

Mr. **Guarini**. And you have no way of even coming in and enforcing, even implementing the code if they want to keep you out of their facilities, is that correct?

Mr. **Connolly**. That is correct.

Mr. **Guarini**. You state that the cause of the accident that happened here is a violation of the building regulations of our State and acceptable building practices, is that correct?

Mr. **Connolly**. Yes, that is correct.

Mr. **Guarini**. And where you have, what was put into the record and read by Mr. Goldmark, the statement on drawing ED-1, "maximum allowed static load per hanger tab shall be 60 pounds with a minimum hanger wire size number 8," and then it goes on and says, "Note A," in their drawings, "If hanger tabs are used to hang plaster ceilings, sufficient tabs must be used to limit load to 60 pounds on any one tab."

Now, if that happened in one of your buildings in the State of New Jersey, and obvious notice had been given and taken concerning the inadequacy of the tabs and the weight load, what would be the sanction of the State of New Jersey over anybody else in the State besides the port authority? What would be the responsibility and what would be the sanction against the company in a violation of this nature?

Mr. **Connolly**. It would be threefold. First, you would not allow them to put it up. Second, if they started to put it up, you would order them to stop. If they would not stop, they would be subject either to a stop work order, which means work on the project would have to stop. They would also be subject to the assessment of civil penalties. And the ultimate remedy is you need a certificate of occupancy to use a building, and the agency would simply refuse to issue the certificate of occupancy and the building could not be used.

Mr. **Guarini**. Would there be criminal penalties?

Mr. **Connolly**. No.

Mr. **Guarini**. If a person had done this and not complied with the laws?

Mr. **Connolly**. There might be independent criminal penalties that a prosecutor might want to pursue, but there are not any criminal penalties in the building code.

Mr. **Guarini**. If somebody had been killed as a result of it, would there be criminal negligence involved, or manslaughter? If a private individual had done the same thing the port authority had done?

Mr. **Connolly**. That is certainly something a prosecutor would investigate. I am not sure they would conclude that in every case, but depending on the facts, they would certainly look into it.

Mr. **Guarini**. And if responsibility were pinpointed, the proper people should be brought to the responsible level of the law, whether it be negligence or criminal negligence; is that correct?

Mr. **Connolly**. That is correct.

Mr. **Guarini**. Would you think that it would be a role of the Federal Government that gives funds for the building of this building, in your experience, to require a certification and periodic examinations? Or do you think that the State would be in a better position to certify and to perform those inspections?

Mr. CONNOLLY. I think that is primarily the responsibility of the State and its local governments, but I think the Federal Government has some responsibility to deal with the situations where it is not occurring.

Mr. GUARINI. Where should the final responsibility lie, in your opinion, Mr. Connolly, for the safety of the public, in this particular instance?

Mr. CONNOLLY. The safety in buildings' final responsibility rests with the State government.

Mr. GUARINI. If there was any knowledge of the defect as far back as April 1982 and the accident happened in August of 1983, which is a period of more than 1 year, the State government would have come in and taken proper precautions, and would have immediately enforced its code; is that correct?

Mr. CONNOLLY. If we became aware of it.

Mr. ROE. I think we are getting in the line of supposition here. Let me clarify that, if the gentleman yields.

Mr. GUARINI. Certainly.

Mr. ROE. You are not suggesting that the State building code and the enforcers of the State building code, go around and periodically inspect thousands and thousands of buildings of the State to determine whether a ceiling is hanging properly or not?

Mr. CONNOLLY. No.

Mr. ROE. What you are saying in erecting a building, you, and I am in the business so I understand what you are talking about, under the BOCA code, you are responsible. The local building inspector, if he is the one who has been designated and properly licensed, he reviews the plans and specifications. He makes his judgments, issues the building permit, and it has to be built according to a certain set of standards, and if the standards are not in that particular set of drawings, then they are either correct or they are not built, basically, is that not correct?

Mr. CONNOLLY. That is right.

Mr. ROE. Once the building is done, completed, part of what you were getting at in your earlier testimony, after that building is done and the certificate of occupancy is issued along the line, then that building stands there. You do not go back every second year or every 6 months to see whether or not the building is still standing; do you? I know they do not in my town.

Mr. CONNOLLY. No.

Mr. ROE. I mean that is not the intent of the building code.

Mr. CONNOLLY. No; the point I was making is that in terms of structural safety, a building that is constructed under the code remains under the jurisdiction of the code. The building code has remedies when you find a situation, but we do not undertake periodic inspections of these kinds of facilities.

Mr. ROE. That is what I am saying. For example, if the gentleman would yield, you take any of the communities, I happen to agree with you, being a little knowledgeable in your field. When we speak to national legislation, you have 50 States involved. And there is all kinds of different types of construction. But New Jersey is ahead of many States because it has a uniform code. Is that a fair statement to make?

Mr. CONNOLLY. That is very correct.

Mr. Roe. And very correct. But in order to implement that, how many people do you have working for your department, for example? Statewide.

Mr. Connolly. In our department we have, working on the uniform construction code, about 125.

Mr. Roe. And then throughout the rest of the State where they are license ineligible, we have our local building inspectors.

Mr. Connolly. About 3,000.

Mr. Roe. About 3,000, to run the whole State is really what it amounts to. So it is not the intent under the BOCA code to go back and say that every single building in New Jersey is periodically inspected. It would take 50,000 people to do that. You could not do it.

What you are coming back and saying that if a deficiency is observed someplace along the line, then of course we want to move and get it corrected and that is a process that we follow at this point.

But you did say earlier in your discussion that this type of an accident, and I am not judging it, I am just listening to your testimony. I feel very strongly about this, as Frank does, and as Jim Howard does. That this happened, but it was unique that it happened. That that ceiling fell down. But if you had to approve the plans and specifications, the specific question, and you looked at that kind of a proposed structure, you would not have approved that.

Mr. Connolly. That is correct.

Mr. Roe. That is all I am saying.

Mr. Guarini. I thank the gentleman for bringing out that point. The only entity responsible for insuring safety in these buildings is the port authority. They had knowledge in April 1982 that there was a defect in the ceiling, and it was so reported.

Now, if you had been the enforcement authority and it came to your knowledge in April 1982, this accident never would have happened on August 8, is that correct, because you would have taken immediate action?

Mr. Connolly. That is speculation.

Mr. Guarini. I know, but if you knew that this ceiling was falling April 8 and that there was a defect in the ceiling, it would be your responsibility to see that the law is enforced.

Mr. Connolly. Yes.

Mr. Guarini. The port authority, as the sole enforcer on their premises, decided not to take any action for almost 16 months. And I would say that the very fact that they had noticed and did not take action, makes them a very inadequate enforcement authority on their own particular building facility.

Let me ask, did the port authority ever approach the building code officers of the community affairs department for any help at any time, or any inspection procedures or cooperate or have any communication with them? Have they been known to have anything to do with the building code authorities of the State of New Jersey, or did they just go off on their own, sir, from your experience?

Mr. Connolly. Virtually no contact with the port authority, in the 8 years that I have been responsible for this.

Mr. Guarini. Thank you, sir.

Mr. ROE. We want to thank you for your testimony. I think you brought a great deal of knowledge to our committee, and I really do not have any other questions I want to ask. Thank you very much.

Mr. CONNOLLY. Thank you.

Mr. ROE. That is our last witness for the day. We want to thank everyone for their cooperation, the witnesses and the members of the press and the other citizenry that are here.

The committee is going to stand adjourned, but the case, of course, will remain open as we proceed and get these other matters that we spoke to resolved.

I want to thank you very much. The committee stands adjourned.

[Whereupon at 12:37 p.m., the committee adjourned.]

[The following was received for the record:]

NATIONAL TRANSPORTATION SAFETY BOARD,
Washington, D.C., November 29, 1983.

Hon. JAMES J. HOWARD,
Chairman, Committee on Public Works and Transportation,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: This is in reply to your letter of November 2, 1983 requesting that the National Transportation Safety Board participate in the November 7, 1983 hearing your Committee held regarding the August 8, 1983 collapse of a ceiling in the public areas of the Journal Square Transportation Center in Jersey City, New Jersey. We share your concerns in this tragic accident.

As we advised your staff, the Safety Board did not receive your request in time to prepare and present a statement at the hearing in New Jersey. We are, however, furnishing for the record the Safety Board's position on the issue of federal agency jurisdiction over passenger terminal accident and the need for legislation in that area.

As you know, the Safety Board is charged with the responsibility for investigating accidents in all modes of transportation and for issuing safety recommendations to reduce the likelihood of such accidents. The Safety Board does not have the authority to investigate mishaps involving a transportation facility, such as the ceiling collapse in the passenger terminal in Jersey City, which are not related to transportation operations, nor does it have the expertise to conduct such an investigation.

While it would certainly be possible, given broader authority and additional appropriations, for the Board to obtain the necessary specialized expertise, we believe these new resources would be an inefficient use of funds in view of the rarity of these types of accidents. We believe the Board's resources can be put to better use in terms of saving lives by means of the traditional areas of Safety Board purview, such as highway accident investigations, where an average of 50,000 lives are lost each year.

In addition, because the regulation of the structural integrity and safety of transportation facilities such as passenger terminals is, and historically has been, a matter of state and local jurisdiction through building and other codes, rather than a matter of federal jurisdiction, we do not believe that the Safety Board should be given authority over such matters unless a compelling need is demonstrated. We are not aware of any evidence that the magnitude of safety problems in these areas would warrant mandating Board investigation of accidents involving these facilities.

Based on the foregoing, we would oppose an extension of our jurisdiction to include the investigation of accidents involving transportation facilities such as passenger terminals which are not related to transportation operations.

Thank you for soliciting our comments.

Respectfully yours,

JIM BURNETT, *Chairman.*

○